ORGANIC CHEMISTRY

TARGET CSIR NET

PREVIOUS YEAR QUESTIONS

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ORGANIC SPECTROSCOPY

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Q1. **The absorption at $\lambda_{max} = 279$ nm ($\varepsilon = 15$) in the UV spectrum of acetone is due to**

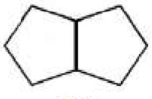
(a) $\pi \rightarrow \pi^*$ transition

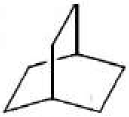
(b) $n \rightarrow \pi^*$ transition

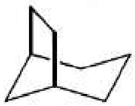
(c) $\sigma \rightarrow \sigma^*$ transition

(d) $\pi \rightarrow \sigma^*$ transition

Q2. **In the broad band decoupled ^{13}C NMR spectrum, the numbers of signals apperating for the bicyclooctane A-C , respectively are**


(A)


(B)


(C)

(a) Five, four and eight

(b) Three, two and five

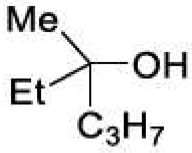
(c) Five, four and five

(d) Three, two and eight

Q3. **In the mass spectrum of dichlorobenzene the ratio of the peaks at *m/z* 146, 148 and 150, is:**

(a) 1:1:1 **(b) 3:3:1** **(c) 1:2:1** **(d) 9:6:1**

Q4. **In the mass spectrum of the compound given below, during the α-cleavage, the order of preferential loss of groups is:**



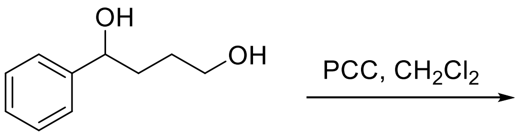
(a) Me > C_3H_7 > Et

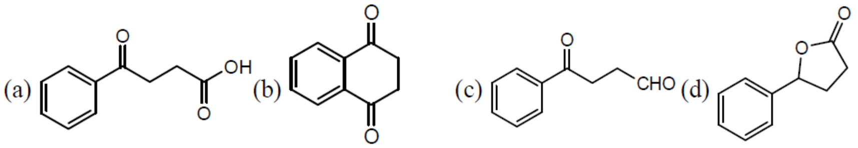
(b) C_3H_7 > Et > Me

(c) Et > Me > C_3H_7

(d) Et > C_3H_7 > Me

Q5. **The major compound X formed in the following reaction exhibited a strong absorption at $\nu_{max} = 1765$ cm^{-1} in the IR spectrum. The structure of X is:**



(a)


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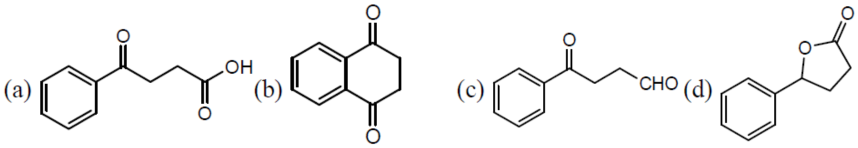
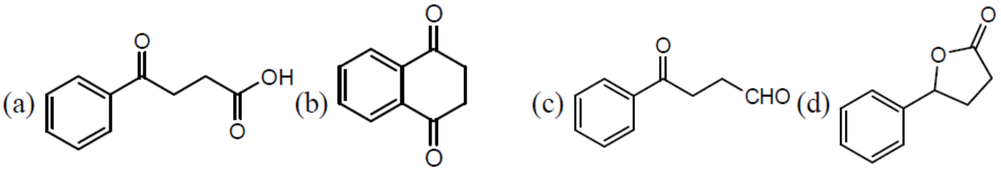
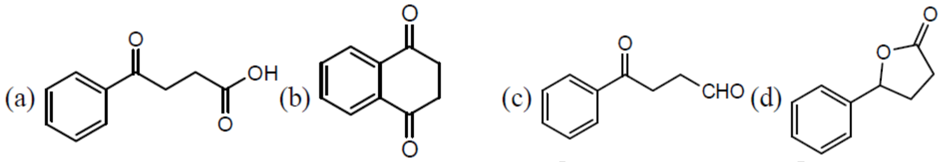
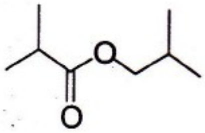


(c)


(d)


Q 6. An organic compound A ($C_8H_{16}O_2$) on treatment with an excess of methyl-magnesium chloride generated two alcohols B and C, whereas reaction of A with lithium aluminium hydride generated only a single alcohol C. Compound B on treatment with an acid yielded an olefin (C_6H_{12}), which exhibited only a singlet at δ =1.6 ppm in the ^{1}H NMR spectrum. The compound A is:

(a)


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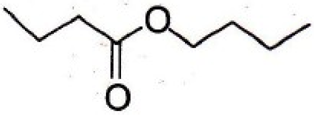

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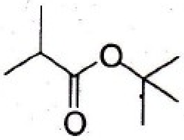

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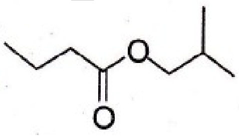

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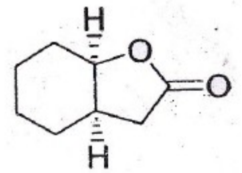
Q 7. In the IR spectrum, carbonyl absorption band for the following compound appears at



(a) 1810 cm^{-1}
(b) 1770 cm^{-1}
(c) 1730 cm^{-1}
(d) 1690 cm^{-1}

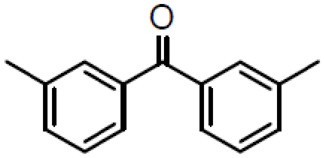
Q8. In the mass spectrum of dodecahedron ($C_{20}H_{20}$) , approximate ratio of the peaks at *m/z* = 260 and 261 is

(a) 1 : 1
(b) 5 : 1
(c) 10 : 1
(d) 20 : 1

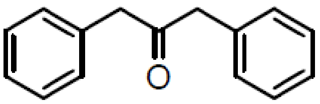
Q 9. An organic compound (MF = $C_8H_{10}O$) exhibited the following ^{1}H NMR spectral data: δ 2.5 (3H,s), 3.8 (3H, s), 6.8 (2 H, d, *J* = 8 Hz), 7.2 (2 H, d, *J* = 8 Hz) ppm. The compound among the choices, is

(a) 4-ethylphenol
(b) 2-ethylphenol
(c) 4-methylanisole
(d) 4-methylbenzyl alcohol

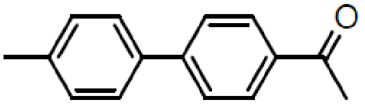
Q 10. An organic compound having molecular formula $C_{15}H_{14}O$ exhibited the following ^{1}H and ^{13}C NMR spectral data.
^{1}H NMR : δ 2.4(s), 7.2 (d, *J* = 8 Hz), 7.7 (d, *J* = 8 Hz)
^{13}C NMR : δ 21.0, 129.0, 130.0, 136.0, 141.0, 190.0

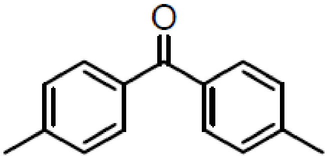


(a)

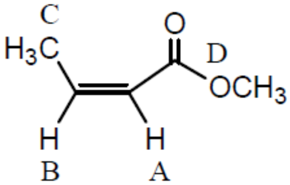


(b)

(c) 

(d) 

Q 11. Appropriate ^{1}H NMR chemical shifts (δ) for the protons A-D for the following compound are



(a) A– 6.8; B –5.7; C–3.9; D –2.1ppm
(b) A– 6.8; B–5.7; C–2.1; D –3.9 ppm
(c) A–5.7; B–6.8; C–3.9; D –2.1 ppm
(d) A– 5.7; B – 6.8; C–2.1; D –3.9 ppm

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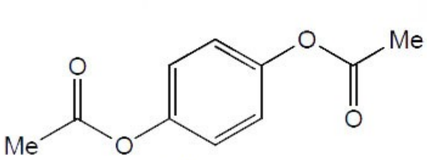
Q 12. The number of signals that appear in the broadband decoupled ^{13}C NMR spectrum of phenanthrene and anthracene, respectively are

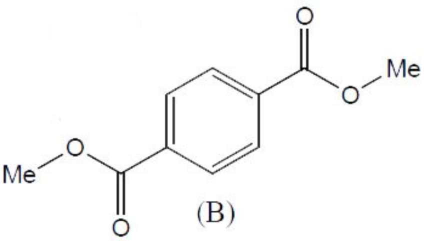
(a) ten and four
(b) ten and ten
(c) seven and four
(d) seven and seven.

Q 13. In the 400 MHz, ^{1}H NMR spectrum of organic compound exhibited a doublet. The two lines of the doublet are at δ 2.35 and 2.38 ppm. The coupling constant (J) value is

(a) 3 Hz
(b) 6 Hz
(c) 9 Hz
(d) 12 Hz

Q 14. Compounds A and B exhibit two singlets, each in their ^{1}H NMR spectra. The expected chemical shifts are at δ


(A)


(B)

(a) 6.9 and 2.1 for A; 7.7 and 3.9 for B
(b) 7.7 and 3.9 for A; 6.9 and 2.1 for B
(c) 6.9 and 3.9 for A; 7.7 and 2.1 for B
(d) 7.7 and 2.1 for A; 6.9 and 3.9 for B

Q15. Match the following

Compound	^{13}C NMR chemical shift (δ ppm)
(A) Acetic acid	(i) 95
(B) Acetonitrile	(ii) 115
(C) Acetone	(iii) 175
(D) Carbon tetrachloride	(iv) 205

(a) (A)-(iii), (B)-(ii), (C)-(iv), (D)-(i)
(b) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)
(c) (A)-(i), (B)-(ii), (C)-(iv), (D)-(ii)
(d) (A)-(iii), (B)-(i), (C)-(iii), (D)-(iv)

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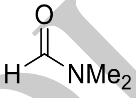
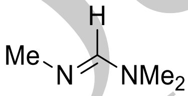
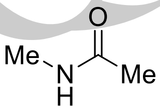
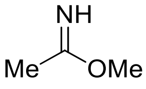
Q 16. In the ^{1}H NMR spectrum recorded at 293 K, an organic compound (C_3H_7NO), exhibited signals at δ 7.8 (1H, s), 2.8 (3H, s) and 2.6 (3H, s). The compound is

(a) 

(b) 

(c) 

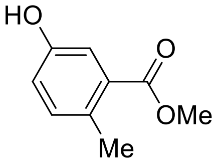
(d) 

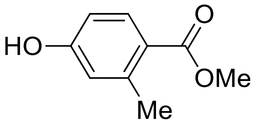
Q 17. In the IR spectrum of p-nitrophenyl acetate, the carbonyl absorption band appears at

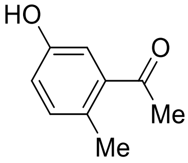
(a) 1670 cm^{-1}
(b) 1700 cm^{-1}
(c) 1730 cm^{-1}
(d) 1760 cm^{-1}.

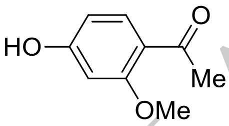
Q 18. An organic compound ($C_9H_{10}O_3$) exhibited the following spectral data:

IR: 3400, 1680 cm^{-1}; ^{1}H NMR: δ 7.8 (1H, d, *J* = 8 Hz), 7.0 (1 H, d, *J* = 8Hz), 6.5 (1H, s), 5.8 (1 H, s, D_2O exchangeable), 3.9 (3H, s), 2.3 (3H, s). The compound is

(a) 

(b) 

(c) 

(d) 

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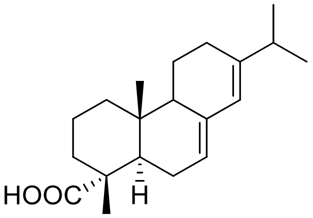
Q 19. In the IR spectrum, the absorption band due to carbonyl group in phenyl acetate appears at
(a) 1800 cm^{-1}
(b) 1760 cm^{-1}
(c) 1710 cm^{-1}
(d) 1660 cm^{-1}

Q 20. In the UV-visible is spectrum, a diterpenoid exhibited a λ_{max} = 275 nm. The compound, among the choices given below is

(a)


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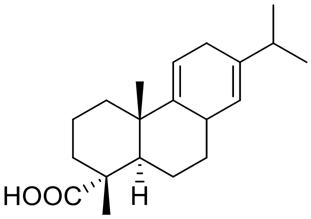
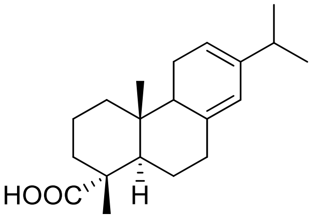
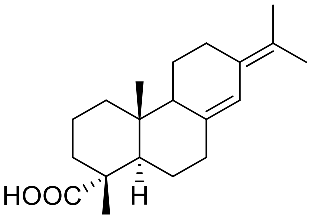
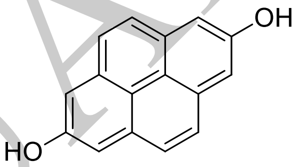


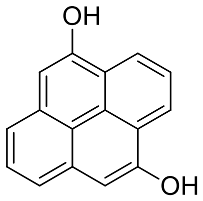
(c)


(d)


Q 21. In the broad band decoupled ^{13}C NMR spectrum, the number of signals appearing for the two pyrene diols A and B



(A)



(B)

(a) eight and eight
(b) eight and sixteen
(c) five and ten
(d) five and eight.

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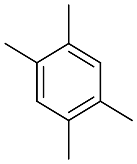
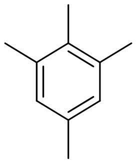
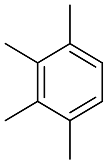
Q 22. In the IR spectrum of p-nitrophenyl acetate, the carbonyl absorption band appears at

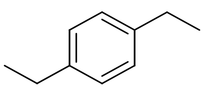
(a) 1660 cm^{-1}
(b) 1700 cm^{-1}
(c) 1730 cm^{-1}
(d) 1770 cm^{-1}

Q 23. An organic compound having the molecular formula $C_{10}H_{14}$ exhibited two singlets in the ^1H NMR spectrum, and three signals in the ^{13}C NMR spectrum. The compound is

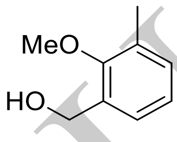
(a) 

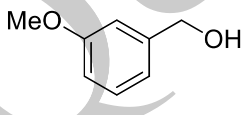
(b) 

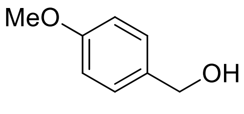
(c) 

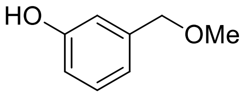
(d) 

Q 24. An organic compound ($C_8H_{10}O_2$), which does not change the color of ferric chloride solution, exhibited the following ^1H NMR spectral data: δ 7.3 (1H, t, *J* = 8 Hz), 7.0 (1H, d, *J* = 8 Hz), 6.95(1H, s), 6.9 (1H, d, *J* = 8 Hz) 5.3 (1H, br, s, D_2O exchangeable), 4.6 (2H, s), 3.9 (3H, s). Structure of the compound is

(a) 

(b) 

(c) 

(d) 

Q 25. Methyl 4-oxopentanoate exhibited signals at δ 208, 172, 51, 37, 32 and 27 ppm in ^{13}C its NMR spectrum. The signals due to the methoxy, C_1, C_4 and C_5 carbons are

(a) OMe –32; C_1–208; C_4-172; C_5-51
(b) OMe-51; Cl-208; C4-172; C5-32
(c) OMe-32; Cl-172; C4-208; C5-51
(d) OMe-51; C_1-172, C_4-208; C_5-32

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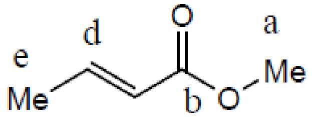
Q 26. The correct ^{13}C NMR chemical (δ) shift values of carbons labeled a-e in the following ester are

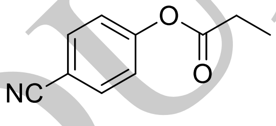


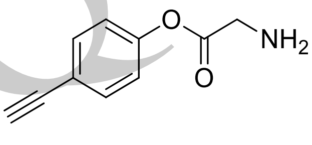
(a) a : 19; b : 143; c : 167; d : 125; e : 52
(b) a : 52; b : 143; c : 167; d : 125; e : 19
(c) a : 52; b : 167; c : 143; d : 125; e : 19
(d) a : 52; b : 167 ; c : 125; d : 143 ; e : 19

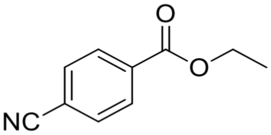
Q 27. An organic compound gives following spectral data:

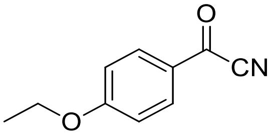
IR : 2210, 1724 cm $^{-1}$, ^{1}H NMR : δ 1.4 (t, *J* = 7.1 Hz, 3H), 4.4 (q, *J* = 7.1 Hz, 2H); ^{13}C NMR : δ 16, 62, 118, 119, 125, 127, 168.

The compound is

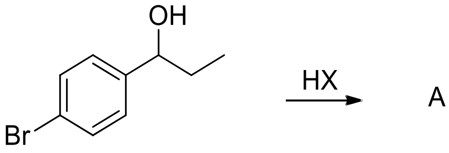
(a) 

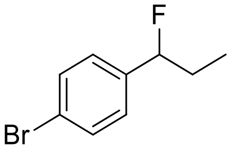
(b) 

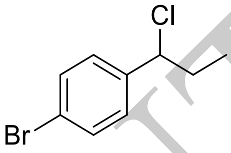
(c) 

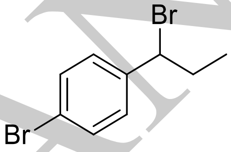
(d) 

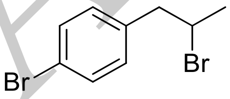
Q 28. The mass spectrum of the product A, formed in the following reaction, exhibits M, M + 2, M + 4 peaks in the ratio of about 1 : 2 : 1. The reagent HX and the product A are



(a) HX = HF and A = 

(b) HX = HCl and A = 

(c) HX = HBr and A = 

(d) HX = HBr and A= 

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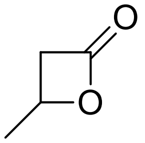
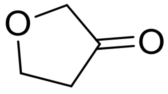
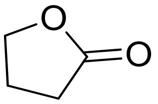
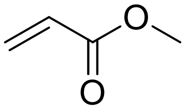
Q 29. A compound with molecular formula C $_4H_6O_2$ shows band at 1770 cm $^{-1}$ in IR spectrum and peaks at 178, 68, 28 and 22 ppm in ^{13}C NMR spectrum. The correct structure of the compound is

(a) 

(b) 

(c) 

(d) 

Q 30. The mass of metastable ion produced due to decomposition of F_1^+ in the following mass fragmentation sequence is

Diethyl-phthalate → F_1^+ → F_2^+ + CO

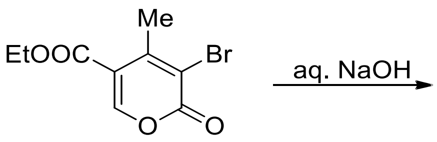
(M + 222) (177)

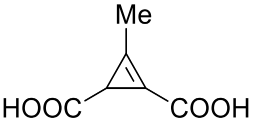
(a) 141.2
(b) 125.4
(c) 45.0
(d) 210.2

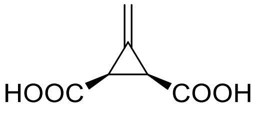
Q 31. The ratio of the relative intensities of the carbon signals in the first order ^{13}C NMR spectrum of CD_3Cl is

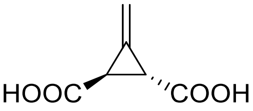
(a) 1:4:6:4:1
(b) 1:3:3:1
(c) 1:6:15:20:15:6:1
(d) 1:3:6:7:6:3:1

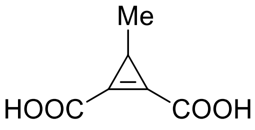
Q 32. The following reactions give a product (racemic) which exhibits the following NMR data:
^{1}H NMR: δ 2.67 (2H,s), 5.60 (2H,s) ppm; ^{13}C NMR : δ 170.3, 129.0, 105.0, 25.4 ppm
The structure of the product (racemic) is



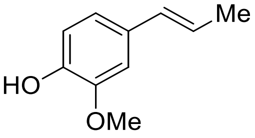
(a)


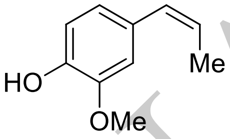
(b)


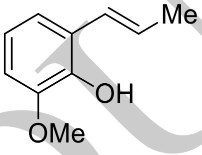
(c)


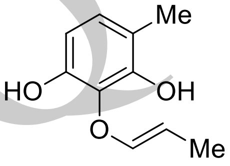
(d)


Q 33. An organic compound having molecular formula $C_{10}H_{12}O_2$ exhibits the following spectral data:
IR: 3400 (br),1600 cm^{-1};
^{1}H NMR: δ 1.85 (3H, d, *J* = 6Hz), 3.8 (3H, s), 5.0 (1H, s, D_2O exchangeable), 6.0 (1H, dq, *J* = 18.6Hz), 6.28 (1H, d, *J* =18 Hz), 6.75 (1H, d, *J* = 8 Hz), 6.8 (1H, s), 6.90 (1H, d, *J* = 8 Hz) ppm;
^{13}C NMR : δ 146.5, 144.0,131.0, 130.5, 123.0, 119.0,114.0, 108.0, 55.0,18.0 ppm.
The structure of the compound is

(a)


(b)


(c)


(d)


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Q 34. The ^{1}H NMR spectrum of a dilute solution of a mixture of acetone and dichloromethane in $CDCl_3$ exhibits two singlet of 1:1 intensity. Molar ratio of acetone to dichloromethane in the solution is

(a) 3 : 1
(b) 1 : 3
(c) 1 : 1
(d) 1 : 2

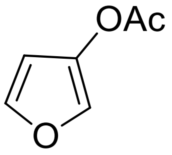
Q 35. Intense band generally observed for a carbonyl group in the IR spectrum is due to

(a) The force constant of CO bond is large
(b) The force constant of CO bond is small
(c) There is no change in dipole moment for CO bond stretching
(d) The dipole moment change due to CO bond stretching is large.

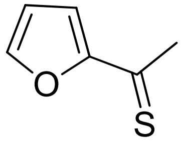
Q 36. Number of signals in the ^{13}C {^{1}H} NMR spectrum of (R)-4-methylpentan-2-ol are

(a) 3
(b) 4
(c) 5
(d) 6

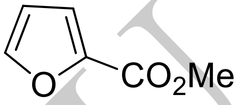
Q37. An organic compounds shows following spectral data:
IR (cm^{-1}): 1680
^{1}H NMR ($CDCl_3$): δ 7.66 (m, 1H), 7.60 (m, 1H), 7.10 (m, 1H), 2.50 (s, 3H)
^{13}C NMR $CDCl_3$: δ 190, 144, 134, 132, 128, 28 *m/z* (EI): 126 (M^+, 100%), 128 (M^+ + 2, 4.9%)
The structure of the compound is



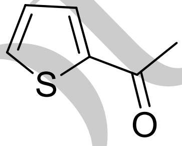
(a)



(b)



(c)



(d)

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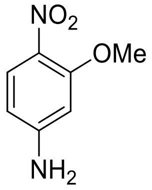
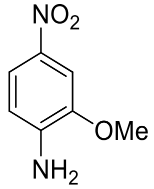
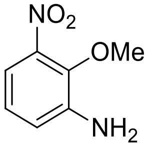
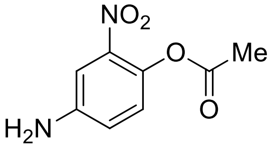
Q 38. The structure of the compounds that matches the 1H NMR data given below is
^{1}H NMR DMSO-d_6 : δ 7.75 dd, J = 8.8, 2.4 Hz, 1H , 7.58 (d, J = 2.4 Hz, 1H), 6.70 (d, J = 8.8

Hz, 1H), 6.50 (broad s, 2H), 3.80 (s, 3H).

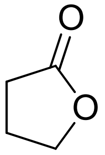
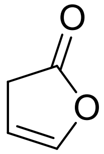
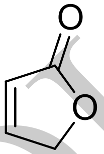
(a)


(b)


(c)


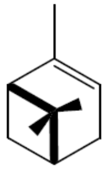
(d)


Q 39. Correctly matched structure and carbonyl stretching frequency set is

COLUMN - A	**COLUMN -B**
(P) 	**(X) 1750 cm^{-1}**
(Q) 	**(Y) 1770 cm^{-1}**
(R) 	**(Z) 1800 cm^{-1}**

(a) P-Y, Q-Z, R-X
(b) P-Y, Q-X, R-Z
(c) P-Z, Q-Y, R-X
(d) P-X, Q-Z, R-Y

Q 40. The number of chemical shift non-equivalent protons expected in 1H NMR spectrum of α-pinene is



α-pinene

(a) 7
(b) 8
(c) 9
(d) 10

Q 41. In the mass spectrum of 1,2-dichloroethane, approximate ratio of peaks at *m/z* values 98, 100, 102 will be
(a) 3 : 1 : 1
(b) 9 : 6 : 1
(c) 1 : 1 : 2
(d) 1 : 2 : 1

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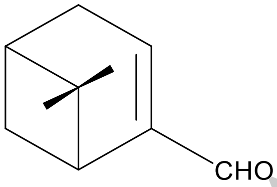
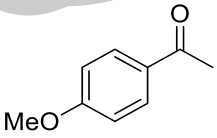
Q 42. In the ^{1}H NMR spectrum of myrtenal, the two methyl groups are expected to display signals at (chemical shift values δ in ppm)

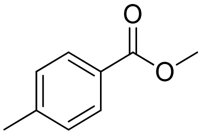


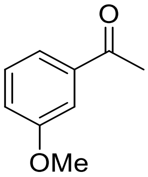
myrtenal

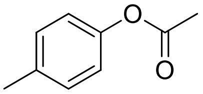
(a) 1.35 (s, 3H) and 5.0 (s, 3H)
(b) 0.74 (s, 3H) and 1.33 (s, 3H)
(c) 1.22 (s, 6H)
(d) 0.07 (s, 6H)

Q 43. A compound displays the following spectral data. The correct structure of the compound is
IR: 1690 cm^{-1}.
^{1}H NMR: δ 2.5 (s, 3H), 3.8 (s, 3H), 6.9 (d, *J* = 8Hz, 2H), 7.8 (d, *J* = 8 Hz, 2H) ppm
^{13}C NMR: δ 197, 165, 130, 129, 114, 56, 26 ppm

(a) 

(b) 

(c) 

(d) 

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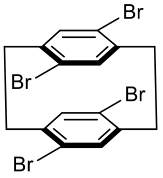
Q44. ^{1}H NMR spectrum of an organic compound recorded on a 500 MHz spectrometer showed a quartet with line positions at 1759, 1753, 1747, 1741 Hz. Chemical shift (δ) and coupling constant (Hz) of the quartet are

(a) 3.5 ppm, 6 Hz
(b) 3.5 ppm, 12 Hz
(c) 3.6 ppm, 6 Hz
(d) 3.6 ppm, 12 Hz

Q 45. Number of signals present in the proton decoupled ^{13}C NMR spectrum of the following compound is

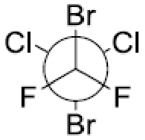


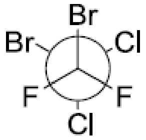
(a) four
(b) six
(c) eight
(d) ten

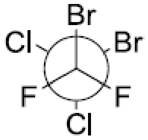
Q 46. ^{1}H NMR spectrum of a mixture of benzene and acetonitrile shows two singlets of equal integration. The molar ratio of benzene: acetonitrile is

(a) 1:1
(b) 2:1
(c) 1:2
(d) 6:1

Q 47. Number of lines in the ^{19}F NMR spectrum of $F_2C(Br)$-$C(Br)Cl_2$ at 120 °C assuming it a mixture of static conformations given below, are

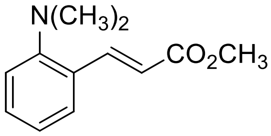


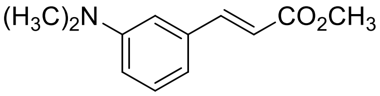


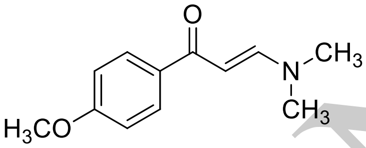


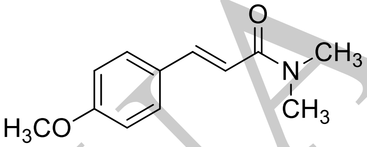
(a) one
(b) two
(c) four
(d) five

Q 48. The compound that exhibits following spectral data is ^1H NMR: δ 8.0 (d, *J* = 12.3 Hz, 1H), 7.7 (d, *J* = 8.0 Hz, 2H), 6.8 (d, *J* = 8.0 Hz, 2H), 5.8 (d, *J* = 12.3 Hz, 1H), 3.8 (s, 3H), 3.0 (s, 6H) ppm

(a)


(b)


(c)


(d)


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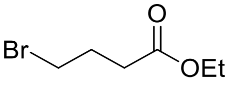
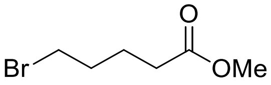
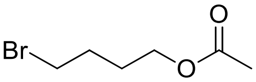
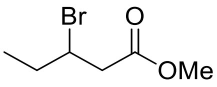
Q 49. ^{13}C NMR spectrum of DMSO-d_6 gives a signal at δ 39.7 ppm as a
(a) singlet
(b) triplet
(c) quintet
(d) septet

Q 50. The correct structure of the compound based on the following characteristic spectral data is
IR: 1736 cm^{-1}
^{1}H NMR: δ 3.59 (s, 3H), 3.32 (t, 2H), 2.25 (t, 2H), 1.85-1.75 (m, 2H), 1.73-1.62 (m, 2H)
^{13}C NMR: δ 174.0, 51.0, 32.9, 32.9, 32.8, 31.0, 23.0

(a)


(b)


(c)


(d)


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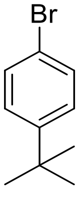
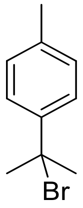
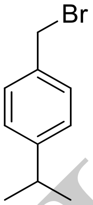
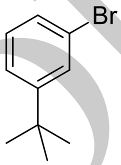
Q 51. The organic compound that displays following data is ^{1}H-NMR (400 MHz): δ 7.38 (d), 7.25 (d), 1.29 (s) ppm

(a)


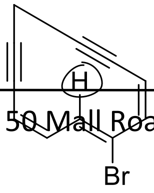
(b)


(c)


(d)


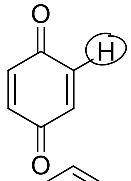
Q 52. The correct match of the circled protons in Column P with ^{1}H NMR chemical shift (δ ppm) in Column Q is

P **Q**

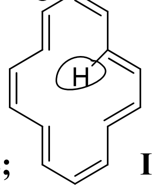


I **A. 6.72**

II **B. 16.4**



III **C. –0.61**



(a) I-A; II-B; III-C
(b) I-B; II-A; III-C
(c) I-B; II-C; III-A
(d) I-C; II-B; III-A

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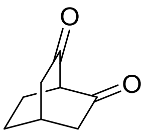
Q 53. Using a double beam UV-visible spectrophotometer, Beer's law fails for $K_2Cr_2O_7$ solution when

- **(a) Intensity of light source is changed**
- **(b) Detector is not a photomultiplier tube**
- **(c) Cuvette of 2cm size is used**
- **(d) pH is not kept same in all measurements**

Q 54. Mass spectrum of a compound shows $[M^{+2}]$ ion peak that is about 4% of M^+. This indicates that the compound has one-

- **(a) fluorine**
- **(b) sulfur**
- **(c) bromine**
- **(d) chlorine**

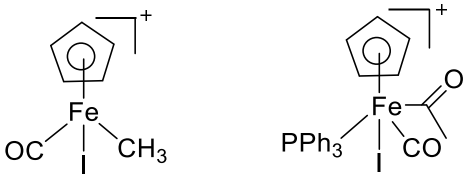
Q 55. Number of signals observed in the ^{13}C NMR spectrum of the following compound is



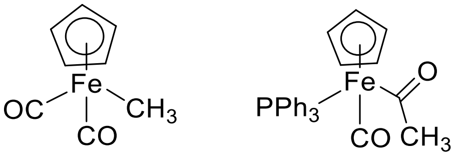
- **(a) 4**
- **(b) 5**
- **(c) 6**
- **(d) 8**

Q 56. The reaction of [(η_5-C_5H_5)Fe (CO_2)] with CH_3I gives compound A. The ^1H NMR spectrum of A shows two singlets in an integrated intensity ratio of 3:5. Compound A upon interaction with PPh_3 gives compound B. The ^1H NMR spectrum of B shows 3 sets of signals in an integrated intensity ratio of 3:5:15. Compounds A and B respectively are

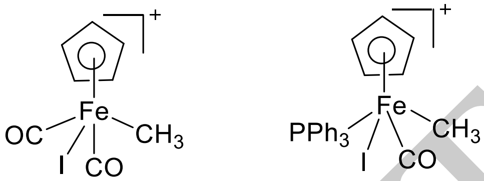
(a)



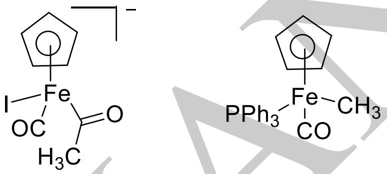
(b)



(c)



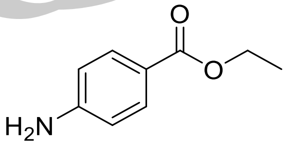
(d)

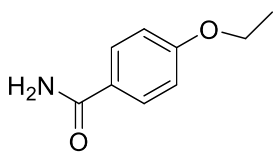


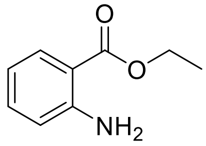
Q 57. A compound shows following spectral data. ^1H NMR: $\delta = 7.9$ (d, $J = 8$ Hz, 2H), 6.6 (d, $J = 8$ Hz, 2H), 4.3 (q, $J = 6$ Hz, 2H). 4.0 (s, D_2O exchangeable), 1.4 (t, $J = 6$ Hz, 3H)
Mass: *m/z* 165, 137,120, 92

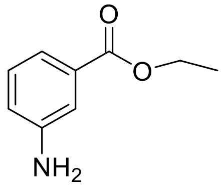
The correct structure of the compound is:

(a)

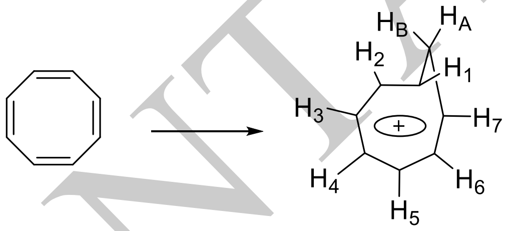


(b)


(c)


(d)


Q 58. The correct match of protons in column A with the ^1H NMR chemical shifts in column B for the product of the following reaction is



Column A	**Column B**
P. H_A	**1. – 0.3**
Q. H_B	**2. 5.1**
R. H_1 and H_7	**3. 6.4**
S. H_{2}-$_{6}$	**4. 8.5**

	P	**Q**	**R**	**S**
(a)	**2**	**1**	**3**	**4**
(b)	**1**	**2**	**4**	**3**
(c)	**4**	**1**	**3**	**2**
(d)	**2**	**4**	**1**	**3**

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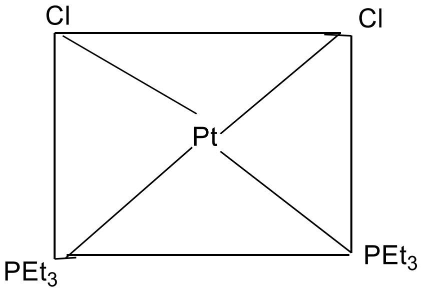
Q 58. In the $^{31}P\ \{^1H\}$ NMR spectrum of a diamagnetic complex *mer*–$[M(PR_3)_3Cl_3]$ expected number of resonance is

(a) Three
(b) One
(c) Two
(d) Six

Q60. In IR spectra, the stretching frequency (in cm^{-1}) of the carbonyl group of the following compounds is in the order



(a) B > A > C
(b) A> C > B
(c) B > C > A
(d) C > B > A

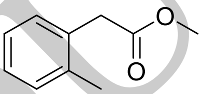
Q 61. The $^{31}P\ \{^1H\}$ NMR spectrum of cis $[Pt(PEt_3)_2Cl_2]$ (^{195}Pt (33.8% abundance) I = ½; its other isotopes are NMR inactive; ^{31}P : I = ½) is comprised with satellite peaks of a

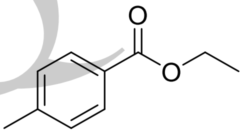
(a) Triplet
(b) Singlet
(c) Doublet
(d) Quartet

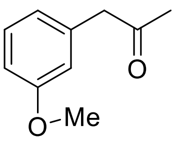
Q 62. Partial spectroscopic data is given below for an organic compound

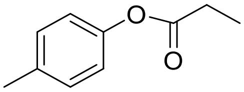
(i) 4 signals between δ 120 -150 ppm in ^{13}C NMR spectrum
(ii) 2 doublets between δ 6.8 - 8.5 ppm in ^1H NMR spectrum
(iii) An absorption band at 1724 cm^{-1} in IR spectrum

The structure of the compound is

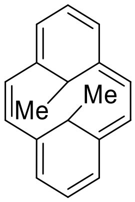
(a) 

(b) 

(c) 

(d) 

Q 63. The compound P undergoes a pericyclic reaction under photochemical conditions to give compound Q. In compound Q, the relative stereochemistry and ^{1}H NMR chemical shift values of methyl groups (in δ ppm), respectively, are



- **(a) Cis; -5**
- **(b) Trans; 17**
- **(c) Cis; 17**
- **(d) Trans; -5**

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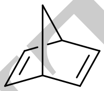
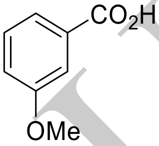
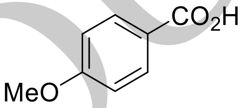
Q 64. The number of ^{1}H NMR signals observed for the following compound is

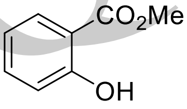


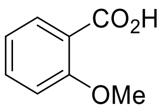
- **(a) 3**
- **(b) 4**
- **(c) 5**
- **(d) 6**

Q 65. The compound that will show a base peak at *m/z* 120 in its EI mass spectrum is

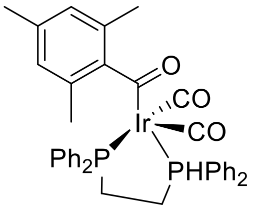
(a) 

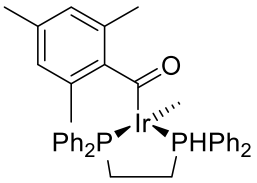
(b) 

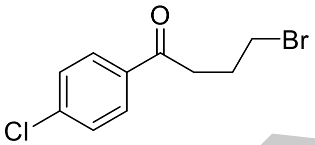
(c) 

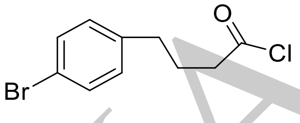
(d) 

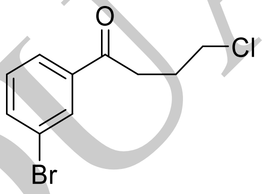
Q 66. The compound that exhibits the following spectral data is
IR : (v) 1685 cm^{-1}; ^{1}H NMR : δ = 7.84 (d, *J* = 8 Hz, 2H), 7.60 (d, *J* = 8 Hz, 2H), 3.65 (t, *J* = 7 Hz, 2H), 3.18 (t, *J* = 7 Hz, 2H), 2.25 (pentet, *J* = 7Hz, 2H) ppm; ^{13}C NMR : δ = 28, 36. 45, 128, 130, 133, 137, 197 ppm; EI MS *m/z*: 200, 198 (1:1), 185, 183 (1:1)



(a) 

(b) 

(c) 

(d) 

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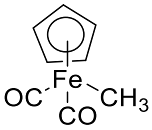
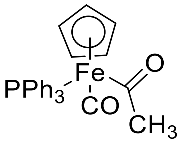
Q 67. In IR spectrum, recorded neat, a compound shows a strong and broad band at 3300 cm^{-1}. The band becomes sharp and shifts to 3600 cm^{-1} when the spectrum is recorded in CCl$_4$ at high dilution. This proves that the compound has

- **(a) OH group, which is involved in intra-molecular H-bonding**
- **(b) OH group, which is involved in inter-molecular H-bonding**
- **(c) A terminal alkyne group**
- **(d) OH group, present in severely sterically hindered environment**

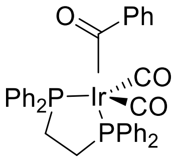
Q 68. The correct match of ^{13}C NMR chemical shift values (δ ppm) for pyridine is





- (a) **C_2 : 136, C_3 : 124; C_4 : 150**
- (b) **C_2 : 124, C_3 : 150; C_4 : 136**
- (c) **C_2 : 150, C_3 : 124; C_4 : 136**
- (d) **C_2 : 150; C_3 : 136; C_4 : 124**

Q 69. For the complex shown below in non-fluxional state, the expected ^{31}P (^{1}H) NMR resonance (s) is/are [^{31}P : I = ½]

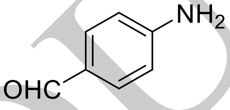


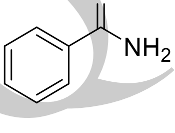
- (a) **One singlet**
- (b) **One doublet**
- (c) **Two singlets**
- (d) **Two doublets**

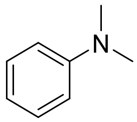
Q 70. The frequency of O-H stretch occurs at 3600 cm^{-1} The O-D stretch frequency (in cm^{-1}) would be closest to

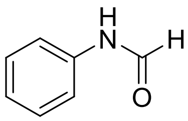
- **(a) 3000**
- **(b) 2600**
- **(c) 1800**
- **(d) 900**

Q 71. The compound that shows peaks in the EI mass spectrum at *m/z* 121, 105, 77, 44 is

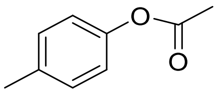
(a) 

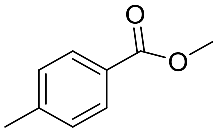
(b) 

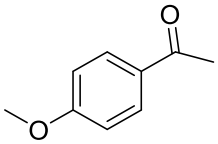
(c)


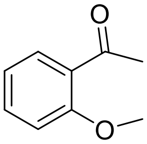
(d)


Q 72. The structure of the compound which displays the following spectral data is
IR = 1690, 1100 cm^{-1}
^{1}H NMR: δ 2.8 (s, 3H), 3.8 (s, 3H), 6.9 (d, *J* = 8 Hz, 2H), 7.8 (d, *J* = 8 Hz, 2H)
^{13}C NMR: δ 197, 165, 130, 129, 114, 56, 26

(a)


(b)


(c)


(d)


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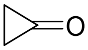
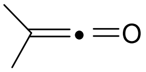
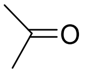
Q 73. The natural product that gives a signal at 218 ppm in its ^{13}C NMR spectrum is
- **(a) α-pinene**
- **(b) camphor**
- **(c) geraniol**
- **(d) carvones**

Q 74. The correct order of carbonyl stretching frequency of the given compounds is


A


B

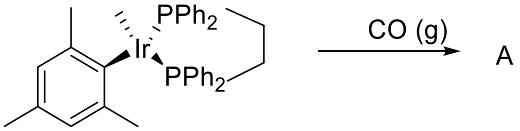

C

(a) A > B > C
(b) B > C > A
(c) C > A > B
(d) B > A > C

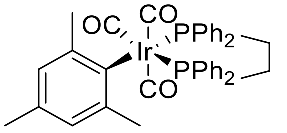
Q 75. The number of peaks with relative intensities observed in the ^{1}H NMR spectra of [$(Cp)_2Fe(CO)_2$] at +30 °C and -80 °C in diethyl ether are, respectively

(a) Two peaks (1:1) and four peaks (5:2:2:1)
(b) One peak and two peaks (1:1)
(c) Two peaks (1:1) at both the temperatures
(d) One peak and four peaks (5:2:2:1)

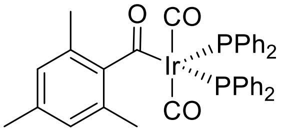
Q76. The infrared (IR) spectrum of the product A for the following reaction



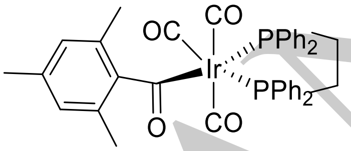
shows three strong bands at 1986, 1935, and 1601 cm^{-1}. The correct structure of A is



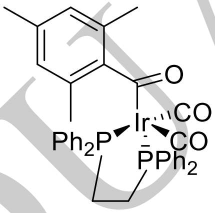
(a)



(b)

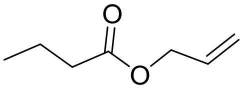


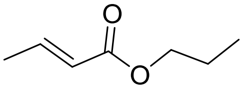
(c)

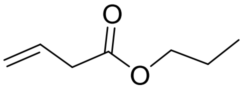


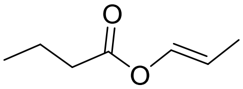
(d)

Q 77. The structure that exhibits the following spectral data is
IR (ν_{max}): 1740 cm^{-1}
^{1}H NMR: δ = 0.9 (t, 3H), 1.6 (sext, 2H), 2.3 (t, 2H), 4.6 (d, 2H), 5.2 (d, 1H), 5.4 (d, 1H), 5.9 (m, 1H) ppm
EI-MS (*m/z*): 71 (100%)

(a) 

(b) 

(c) 

(d) 

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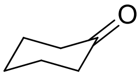
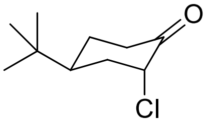
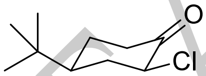
Q78. The correct order of C=O stretching frequency in IR spectrum for the following compound is

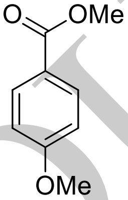

A

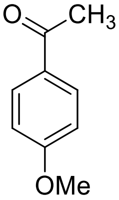

B

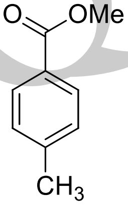

C

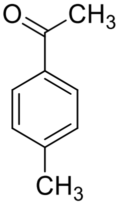
(a) A > C > B
(b) B > C > A
(c) C > B > A
(d) B > A > C

Q79. Which of the following molecule has the ^{1}H NMR spectrum:
δ 2.4 (s, 3H), 3.9 (s, 3H), 7.25 (d, J = 7Hz, 2H), 7.95 (d, J = 7Hz, 2H) ppm.

(a) 

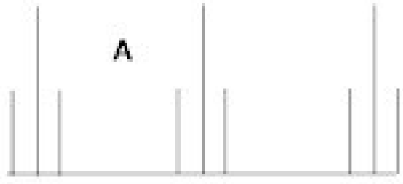
(b) 

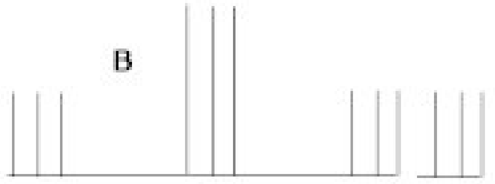
(c) 

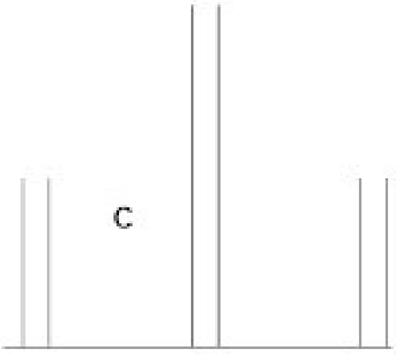
(d) 

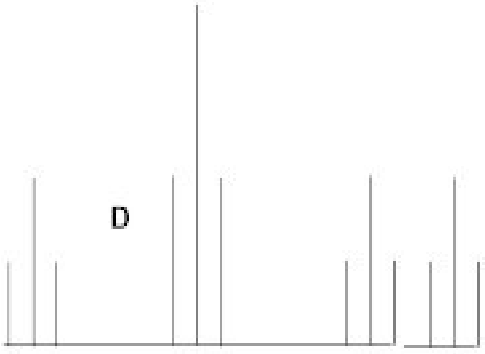
Q80. A compound shows $[M]^+$ at m/z 84 and has base peak at 56. It exhibits only one peak in 1H NMR at δ 1.4ppm and one signal in 13C NMR at δ 35ppm. The compound is
(a) cyclobutane-1,3-dione
(b) dichloromethane
(c) cyclohexane
(d) 1,2,3-trimethylcyclopropane

Q81. Which of the patterns (A,B,C or D) fits best with the ^{13}C NMR spectrum of $TiCl_3(CDH_2)$,
[Given: $J^1_{(C\text{-}H)} > J^1_{(C\text{-}D)}$]









ORGANIC SPECTROSCOPY

ANSWER KEY

1.	(b)	2.	(b)	3.	(d)	4.	(b)	5.	(d)	6.	(a)	7.	(b)
8.	(b)	9.	(c)	10.	(d)	11.	(d)	12.	(c)	13.	(d)	14.	(a)
15.	(a)	16.	(a)	17.	(d)	18.	(d)	19.	(b)	20.	(c)	21.	(c)
22.	(d)	23.	(a)	24.	(b)	25.	(d)	26.	(d)	27.	(c)	28.	(c)
29.	(c)	30.	(b)	31.	(d)	32.	(c)	33.	(a)	34.	(b)	35.	(d)
36.	(d)	37.	(d)	38.	(b)	39.	(a)	40.	(b)	41.	(b)	42	(b)
43.	(a)	44.	(a)	45.	(a)	46.	(c)	47.	(d)	48.	(c)	49.	(d)
50.	(b)	51.	(a)	52.	(b)	53.	(d)	54.	(b)	55.	(c)	56.	(b)
57.	(a)	58.	(a)	59.	(c)	60.	(c)	61.	(b)	62.	(b)	63.	(d)
64.	(b)	65.	(c)	66.	(a)	67.	(b)	68.	(c)	69.	(d)	70.	(b)
71.	(b)	72.	(c)	73.	(d)	74.	(d)	75.	(a)	76.	(d)	77.	(a)
78.	(c)	79.	(c)	80.	(c)	81.	(b)						

PERICYCLIC REACTIONS

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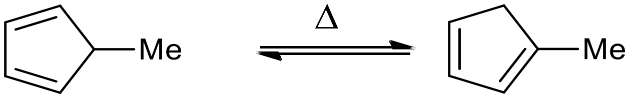
Q1.The reaction given below is an example of



(a) 1,3-sigmatropic hydrogen shift

(b) 1,3 -sigmatropic methyl shift

(c) 1,5 sigmatropic hydrogen shift

(d) 1,5-sigmatropic methyl shift.

Q2.The concerted photochemcial reaction between two olefins leading to a cyclobutane ring is :

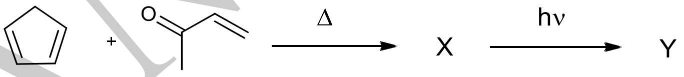
(a) $\pi 2s + \pi 2a$ **cycloaddition**

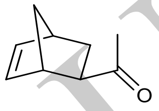
(b) $\pi 2s + \pi 2s$ **cycloaddition**

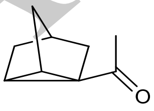
(c) $\sigma 2s + \sigma 2s$ **cycloaddition**

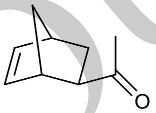
(d) $\pi 2s + \sigma 2a$ **cycloaddition**

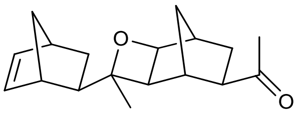
Q3.The structures of the major products X and Y in the followign transformation are

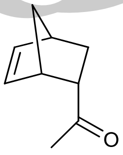


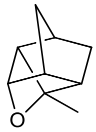
(a) X=


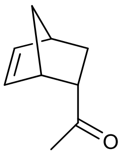
Y=


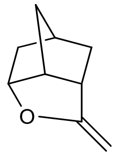
(b) X=


Y=


(c) X=


Y=


(d) X=


Y=


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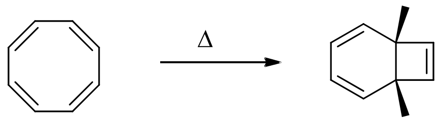
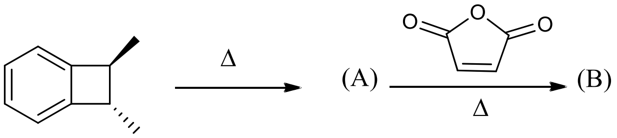
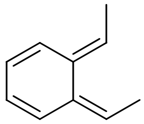
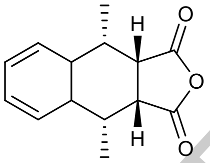
Q4. In the following concerted reaction, the product is formed by a

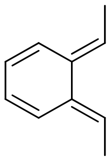
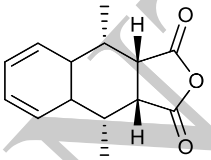


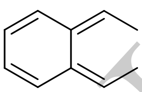
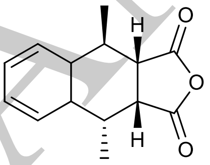
(a) 6π – disrotatory electrocyclisation
(b) 4π – disrotatory electrocyclisation
(c) 6π – conrotatory electrocyclisation
(d) 4π – conrotatory electrocyclisation

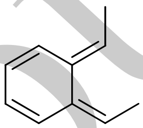
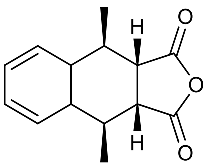
Q5. The major products A and B in the following reaction sequence are



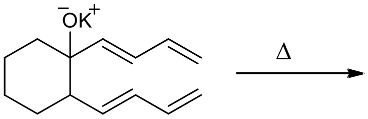
(a)
A = 
B = 

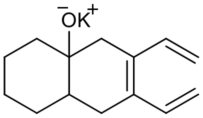
(b)
A = 
B = 

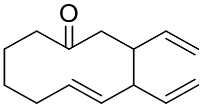
(c)
A = 
B = 

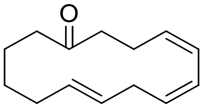
(d)
A = 
B = 

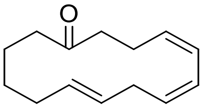
Q6. The product formed and the process involved in the following reaction are



(a)  **[3,3]-sigmatropic rearrangement**

(b)  **[1,3]-sigmatropic rearrangement**

(c)  **[5,5]-sigmatropic rearrangement**

(d)  **[1,5]-sigmatropic rearrangement**

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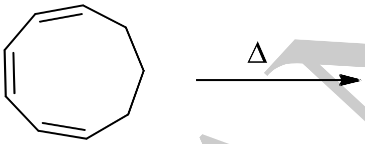
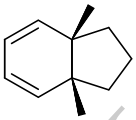
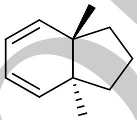
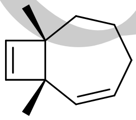
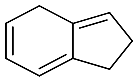
Q7. The major product formed in the following concerted reaction is



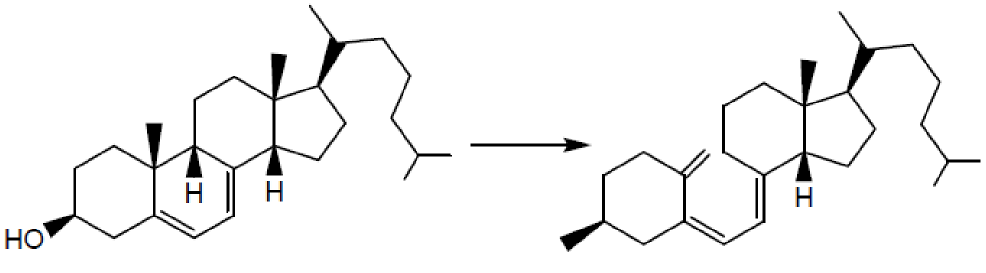
(a) 

(b) 

(c) 

(d) 

Q8. The two step conversion of 7-dehydrocholesterol to vitamin D$_3$ proceeds through



(a) Photochemical electrocyclic disrotatory ring opening; and thermal antarafacial [1, 7]-H shift.
(b) Photochemical electrocyclic conrotatory ring opening; and thermal antarafacial [1, 7]-H shift.
(c) Thermal electrocyclic conrotatory ring opening; and photochemical superafacial [1, 7]-H shift.
(d) Thermal electrocyclic disrotatory ring opening; and thermal suprafacial [1, 7]-H shift.

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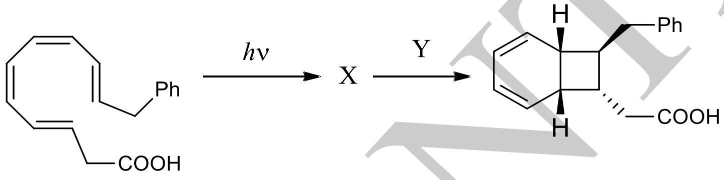
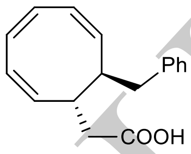
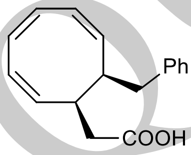
Q9. In the following sequence of pericyclic reactions X and Y are



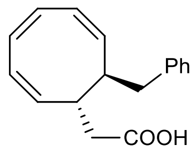
X **Y**

(a) 

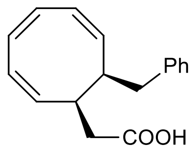
***h*ν/DIS**

(b) 

***h*ν/CON**

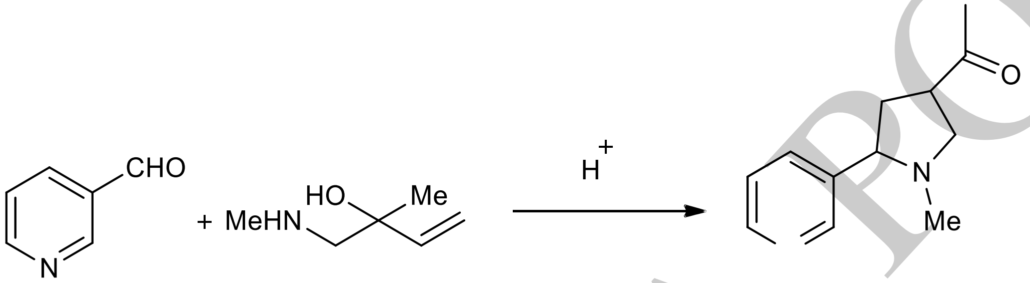
(c) 

Δ/DIS

(d) 

Δ/CON

Q10. The following transformation involves



(a) an iminium ion, [3, 3]-sigmatropic shift and Mannich reaction.
(b) a nitrenium ion, [3, 3]-sigmatropic shift and Michael reaction.
(c) an iminium ion, [1, 3]-sigmatropic shift and Mannich reaction.
(d) a nitrenium ion, [1, 3]-sigmatropic shift and Michael reaction.

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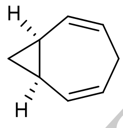
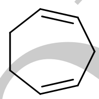
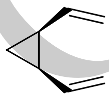
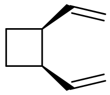
Q11. Among the following dienes, the one that undergoes a degenerate Cope rearrangement is

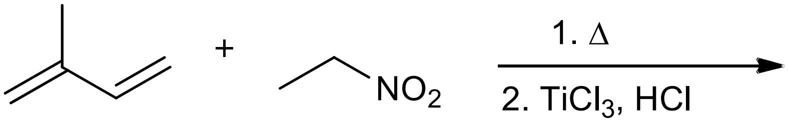
(a) 

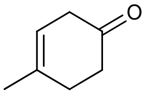
(b) 

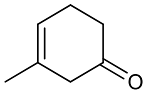
(c) 

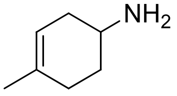
(d) 

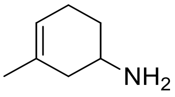
Q12. The major product formed in the following reaction is



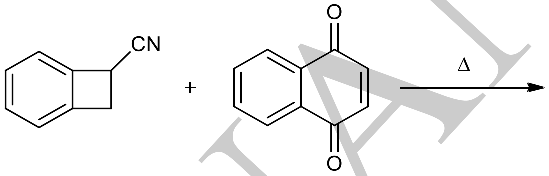
(a) 

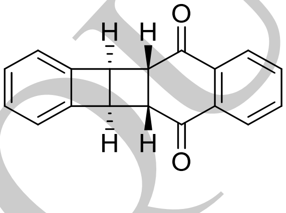
(b) 

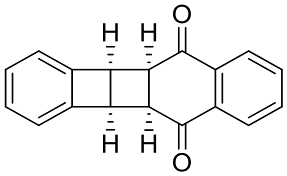
(c) 

(d) 

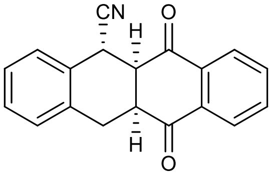
Q13. The major product formed in the following reaction is



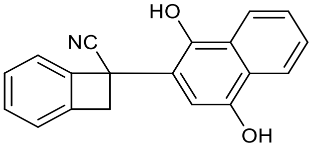
(a) 



(b)

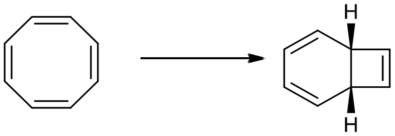


(c)



(d)

Q14. The most appropriate mode of cyclisation in the following transformation is



(a) con-rotatory in photochemical; and dis-rotatory in thermal conditions.
(b) con-rotatory in thermal; and dis-rotatory in photochemical conditions.
(c) con-rotatory in thermal; and con-rotatory in photochemical conditions.
(d) dis-rotatory in photochemical; and dis-rotatory in thermal conditions.

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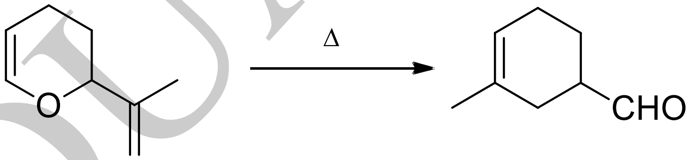
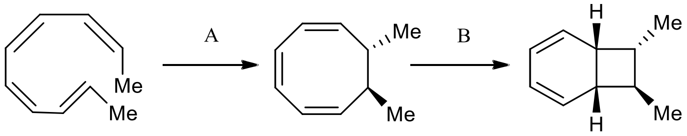
Q15. The following reaction proceeds through a



(a) 1, 3-sigmatropic rearrangement
(b) 2, 3-sigmatropic rearrangement
(c) 3, 3-sigmatropic rearrangement
(d) 3, 5-sigmatropic rearrangement

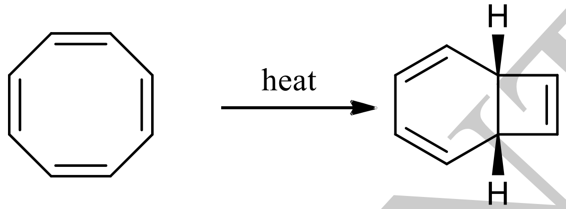
Q16. The number of nodes present in the highest occupied molecular orbital of 1, 3, 5-hexatriene in its
ground state is
(a) one
(b) two
(c) three
(d) four

Q17. The conditions A-B, required for the following pericyclic reactions are



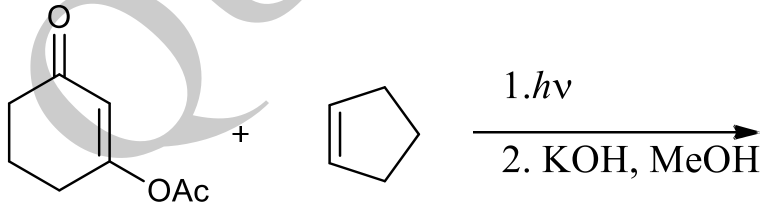
(a) A – Δ; B– Δ
(b) A – hν; B– Δ
(c) A – hν; B– hν
(d) A – Δ; B– hν

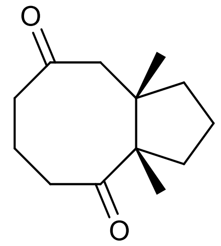
Q18. The number of π electrons participating and the pericyclic mode in the following reaction are



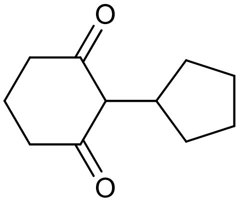
(a) 4 and conrotatory
(b) 4 and disrotatory
(c) 6 and conrotatory
(d) 6 and disrotatory

Q19. The major product formed in the following reaction sequence is

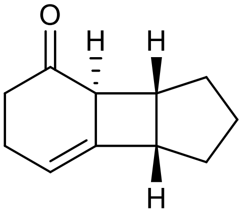




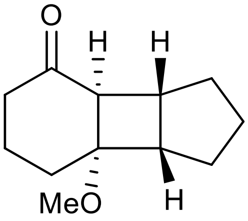
(a)



(b)



(c)



(d)

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Q20. In a Diels-Alder reaction, the most reactive diene amongst the following is

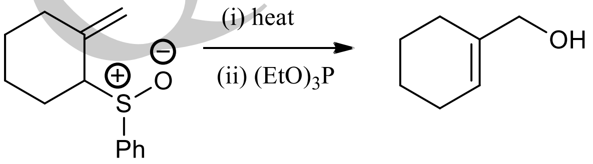
(a) (4E)-1, 4-hexadiene

(b) (4Z)-1, 4-hexadiene

(c) (2E, 4E)-2, 4-hexadiene

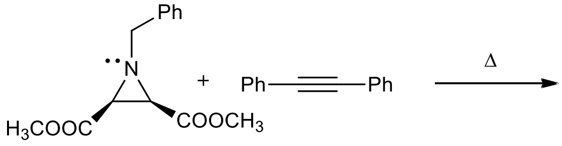
(d) (2Z, 4Z)-2, 4-hexadiene

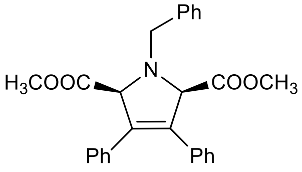
Q21. Pericyclic reaction involved in one of the steps of the following reaction sequence is

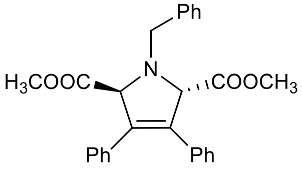


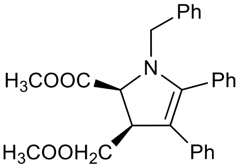
(a) [1, 3] sigmatropic shift
(b) [3, 3] sigmatropic shift
(c) [1, 5] sigmatropic shift
(d) [2, 3] sigmatropic shift

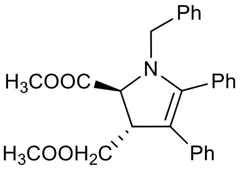
Q22. The major product formed in the following reaction is



(a)


(b)


(c)


(d)


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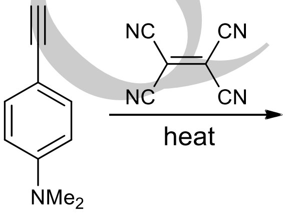
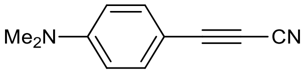
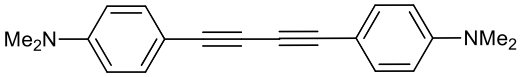
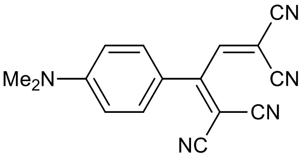
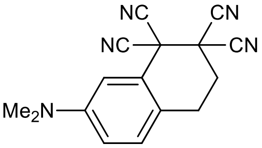
Q23. The major product of the following reaction is



(a) 

(b) 

(c) 

(d) 

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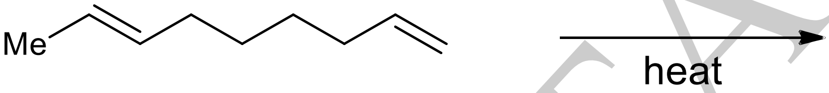
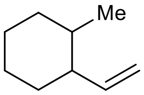
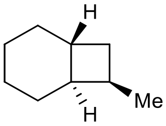
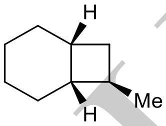
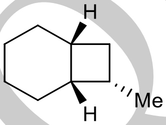
Q24. The major product formed in the following reaction is



(a) 

(b) 

(c) 

(d) 

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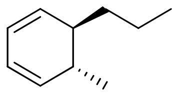
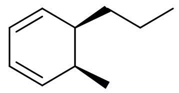
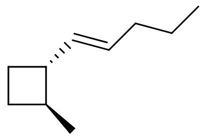
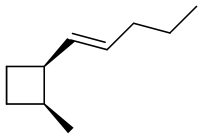
Q25. The major product formed by photochemical reaction of (2E, 4Z, 6E)-decatriene is

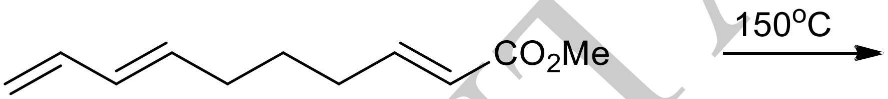
(a)


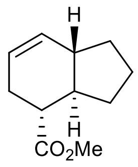
(b)


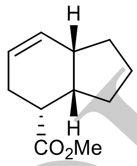
(c)


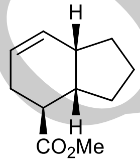
(d)


Q26. The major product formed in the following reaction is

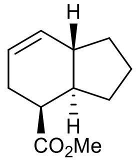


(a)


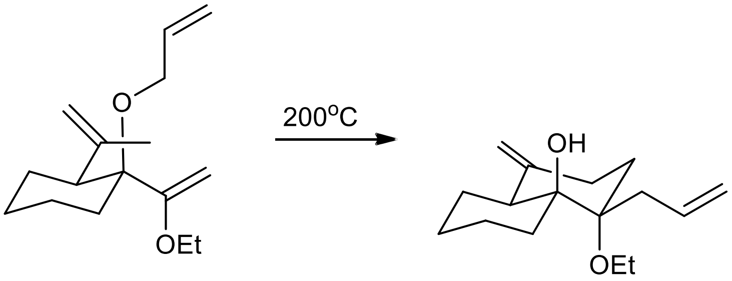
(b)


(c)


(d)

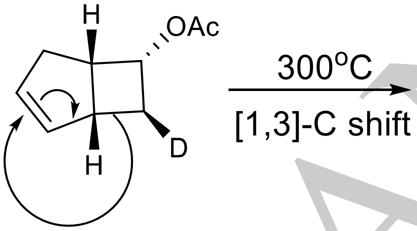


Q27. The following transformation involves sequential

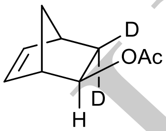


(a) Claisen rearrangement - Cope rearrangement - ene reaction
(b) Cope rearrangement - Claisen rearrangement - ene reaction
(c) Cope rearrangement – ene reaction - Claisen rearrangement.
(d) ene reaction - Claisen rearrangement - Cope rearrangement.

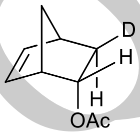
Q28. A concerted [1, 3]-sigmatropic rearrangement took place in the reaction shown below. The structure of the resulting product is

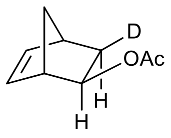


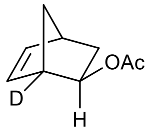
(a)



(b)



(c)


(d)


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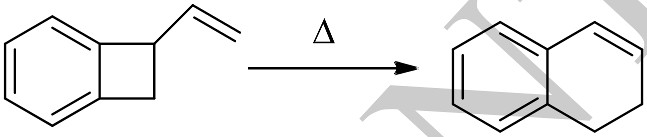
Q29. The frontier orbital interactions involved in the formation of the carbocation intermediate in the reaction of isobutylene with HCl are

(a) π of olefin and σ^* of HCl
(b) π of olefin and σ of HCl
(c) π^* of olefin and σ^* of HCl
(d) π^* of olefin and σ of HCl

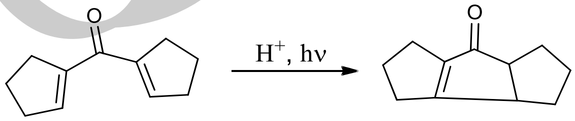
Q30. The following transformation proceeds through two consecutive electrocyclic processes, which are



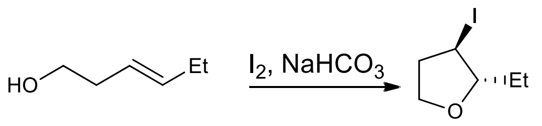
(a) 4π conrotatory and 6π conrotatory
(b) 4π disrotatory and 6π conrotatory
(c) 4π conrotatory and 6π disrotatory
(d) 4π disrotatory and 6π disrotatory

Q31. The correct match for the reactions P-S with the names of cyclizations I-IV is

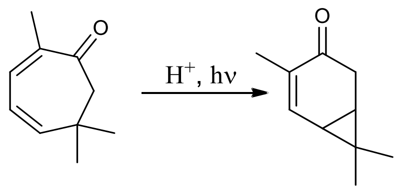
Reactions:

(P)


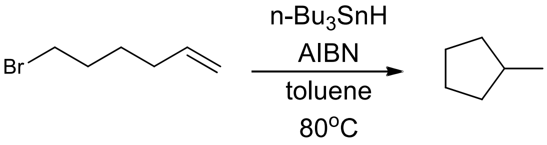
(Q)



(R)



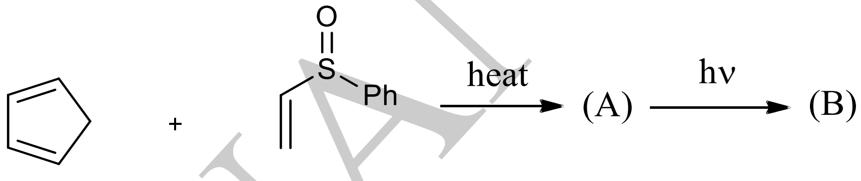
(S)

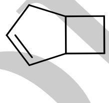
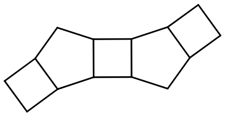


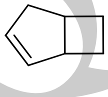
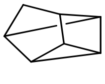
Name of Cyclizations:
(I) halocyclization
(II) Nazarov cyclization
(III) radical cyclization
(IV) electrocyclization

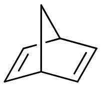
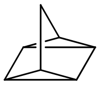
(a) P-IV; Q-I; R-II, S-II
(b) P-II; Q-I; R-IV; S-III
(c) P-IV; Q-II; R-III; S-I
(d) P-II; Q-I; R-III; S-IV

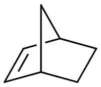
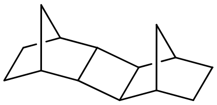
Q32. The major products A and B formed in the following reaction sequence are



(a) A =  **B=** 

(b) A =  **B=** 

(c) A =  **B=** 

(d) A =  **B=** 

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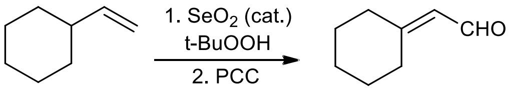
Q33. The correct sequence of pericyclic reactions involved in the following transformation is



(a) (i) ene reaction, (ii) [2,3]-sigmatropic shift, (iii) [3,3]-sigmatropic shift
(b) (i) ene reaction, (ii) [3,3]-sigmatropic shift, (iii) [1,3]-sigmatropic shift
(c) (i) [2,3]-sigmatropic shift, (ii) ene reaction, (iii) [1,3]-sigmatropic shift
(d) (i) [1,3]-sigmatropic shift, (ii) [2,3]-sigmatropic shift, (iii) [3,3]-sigmatropic shift

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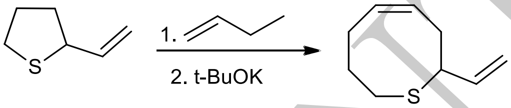
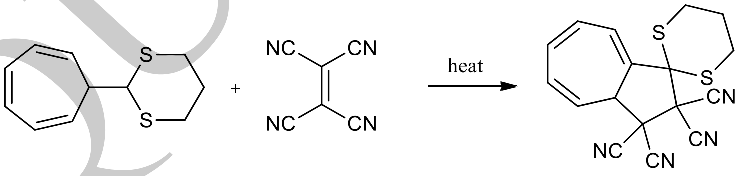
Q34. Following reaction is an example of



(a) Ramberg-Backlund reaction
(b) [2, 3]-sigmatropic shift
(c) [3, 3]-sigmatropic shift
(d) Pummerer rearrangement

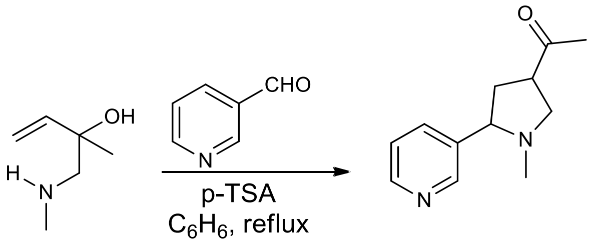
Q35. Following reaction is an example of



(a) [3 + 2] cycloaddition
(b) [4 + 2] cycloaddition
(c) [6 + 2] cycloaddition

(d) [8 + 2] cycloaddition

Q36. Following reaction involves



(a) Claisen followed by Mannich reaction
(b) aza-Cope followed by Mannich reaction
(c) Claisen followed by aza-aldol reaction
(d) aza-Cope followed by aza-aldol reaction

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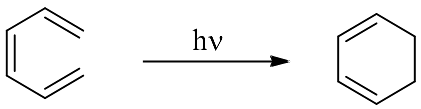
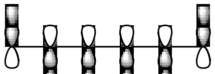
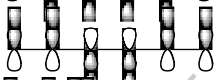
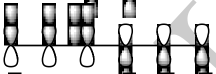
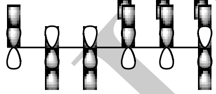
Q37. According to Frontier Moleculaor Orbital (FMO) Theory, the Highest Occupied Molecular Orbital (HOMO) of hexatriene in the following reaction is



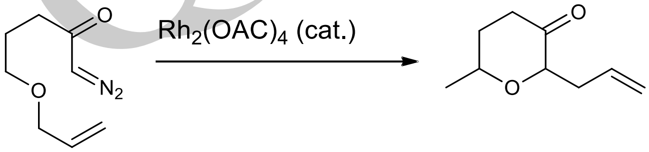
(a)


(b)


(c)


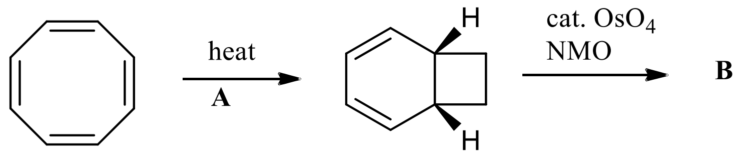
(d)


Q38. The following reaction involves

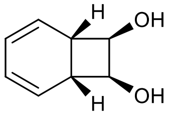


(a) [1, 2] sigmatropic rearrangement
(b) [2, 3] sigmatropic rearrangement
(c) [3, 3] sigmatropic rearrangement
(d) C-H insertion reaction

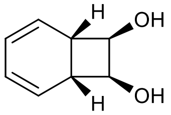
Q39. In the following transformation, the mode of electrocyclization A and the major product B are



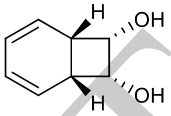
(a) A = (4n) e– , dis **B =**



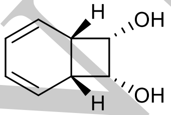
(b) A = (4n + 2) e– , dis **B =**



(c) A = (4n) e– , con **B =**



(d) A = (4n + 2) e– , con **B =**



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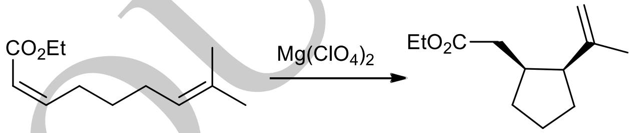
Q40. Following reaction is an example of



(a) Alder-Ene reaction
(b) Michael addition
(c) Sigmatropic Rearrangement
(d) Wagner-Meerwein Rearrangement

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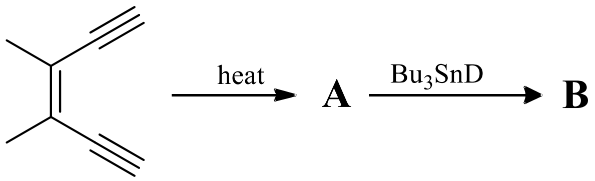
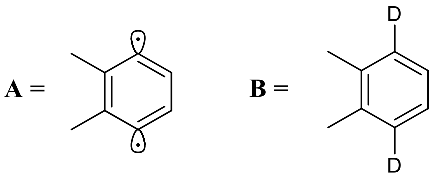
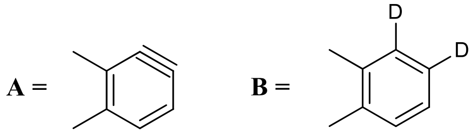
Q41. The structure of the intermediate A and the major product B, formed in the following reaction are

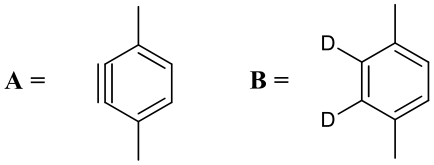




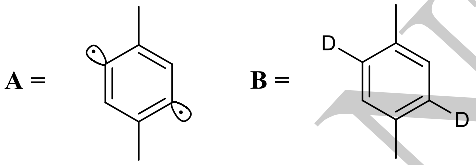
(a)



(b)

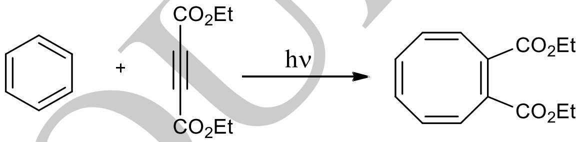


(c)



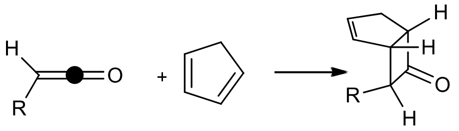
(d)

Q42. Mechanism of the following transformation involves



(a) A [2+2] cycloaddition followed.by *'con'* rotatory electrocyclic ring opening
(b) A [4+2] cycloaddition followed by *'con'* rotatory electrocyclic ring opening
(c) A [4+2] cycloaddition followed by Cope- rearrangement
(d) A [2+2] cycloaddition followed.by *'dis'* rotatory electrocyclic ring opening

Q43. For the following thermal [2+2] cycloaddition reaction, the correct statement about Transition State (TS) and preference for *endo* product formation is



(a) TS: $\pi 2s + \pi 2s$; Me > i-Pr > t-Bu

(b) TS: $\pi 2s + \pi 2a$; t-Bu > i-Pr > Me

(c) TS: $\pi 2s + \pi 2a$; Me > i-Pr > t-Bu

(d) TS: $\pi 2s + \pi 2s$; t-Bu > i-Pr > Me

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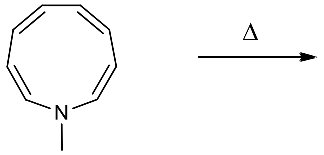
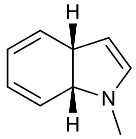
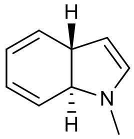
Q44. The major product formed in the following reaction is:



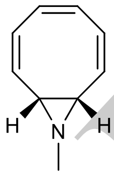
(a)



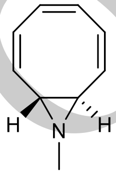
(b)



(c)



(d)



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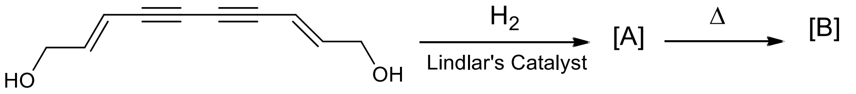
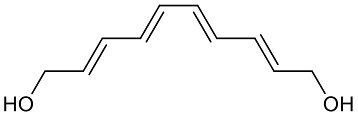
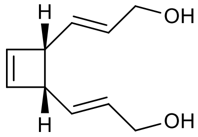
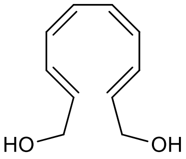
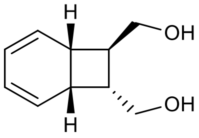
Q45. The intermediate A and the major product B, formed in the following reaction are

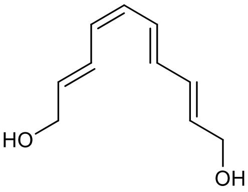


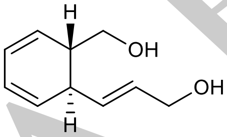
(a) [A] =


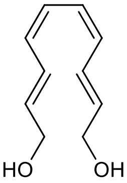
[B]=


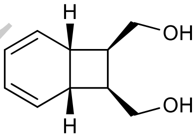
(b) [A] =


[B]=


(c) [A] =


[B]=


(d) [A] =


[B]=


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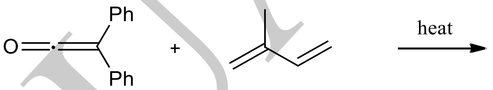
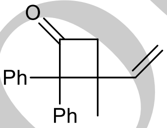
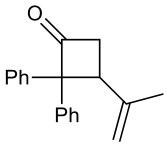
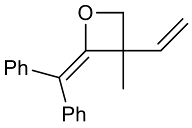
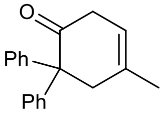
Q46. The major product formed in the following reaction is:



(a)


(b) 

(c) 

(d) 

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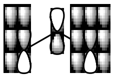
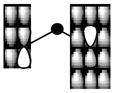
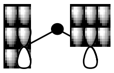
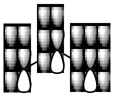
Q47. The HOMO of π–molecular orbitals of methylazide is

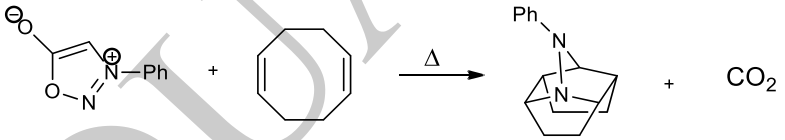
(a) 

(b) 

(c) 

(d) 

Q48. The following transformation involves a series of



(a) electrocyclic ring-opening and closing reaction

(b) cycloaddition and cycloreversion reactions

(c) sigmatropic rearrangements

(d) cheletropic reaction and elimination reaction

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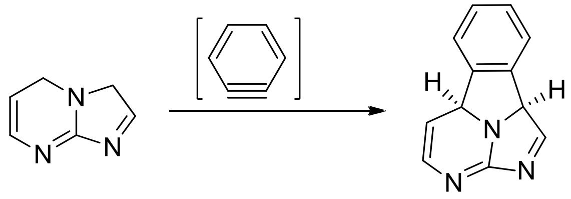
Q49. The following transformation



Is an example of

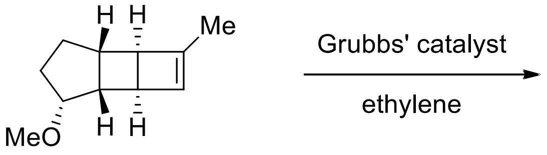
(a) [3π+2π] cycloaddition

(b) [6π+2π] cycloaddition

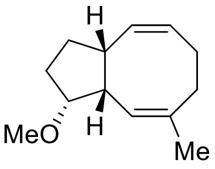
(c) [8π+2π] cycloaddition

(d) [8π+4π] cycloaddition

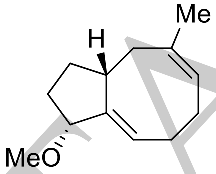
Q50. The major product formed in the following reaction is



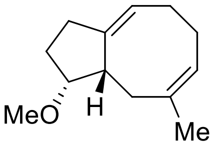
(a)



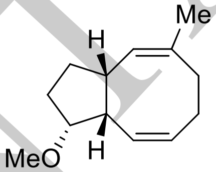
(b)



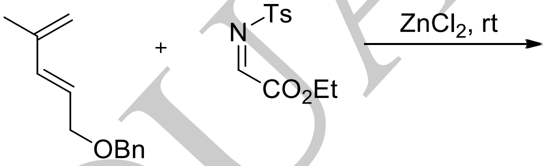
(c)



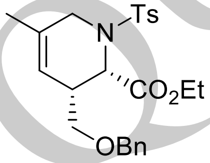
(d)

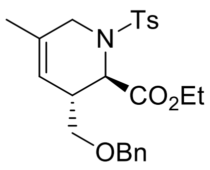


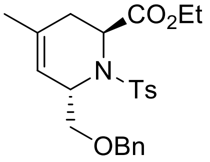
Q51. The major product in the following reaction is

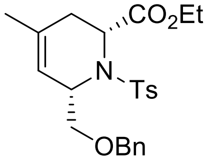


(a)

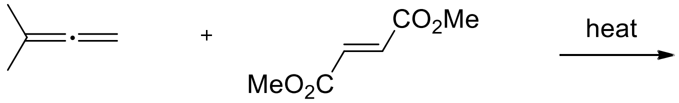


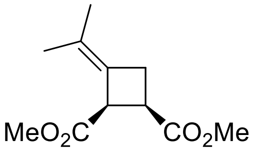
(b)


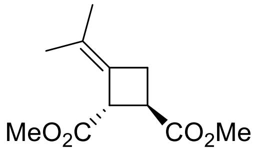
(c)


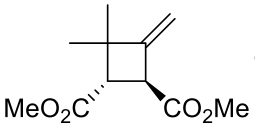
(d)


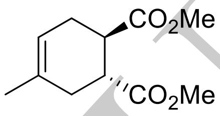
Q52. The major product formed in the following reaction is



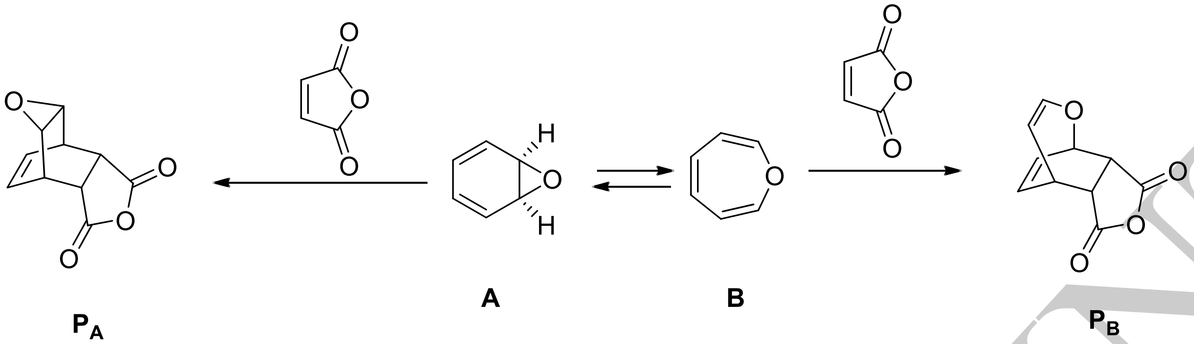
(a)


(b)


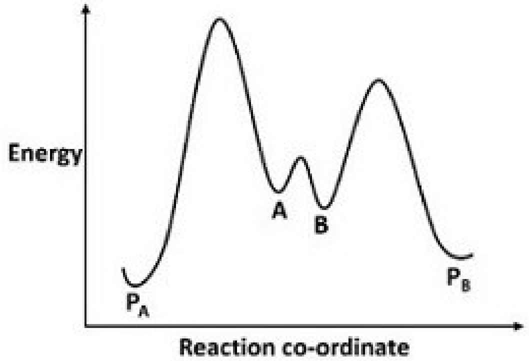
(c)


(d)


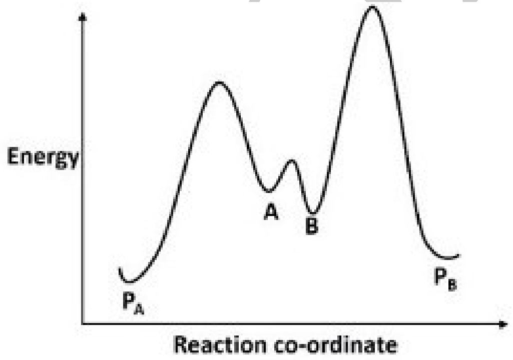
Q53. Consider the following reactions,



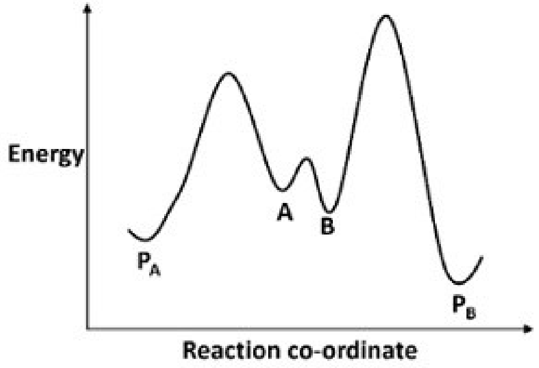
Correct energy profile diagram for the above reaction is



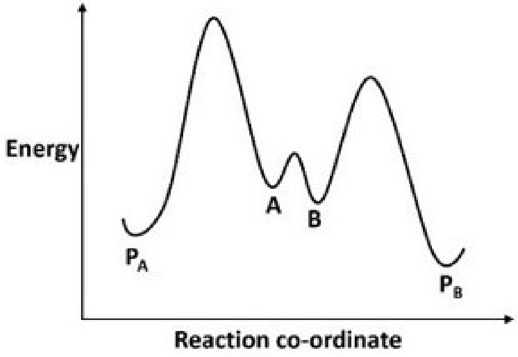
(a)



(b)



(c)



(d)

PERICYCLIC REACTIONS

ANSWER KEY

1.	(c)	2.	(b)	3.	(c)	4.	(a)	5.	(b)	6.	(c)	7.	(a)
8.	(b)	9.	(c)	10.	(a)	11.	(a)	12.	(a)	13.	(c)	14.	(d)
15.	(c)	16.	(b)	17.	(b)	18.	(d)	19.	(a)	20.	(c)	21.	(d)
22.	(b)	23.	(c)	24.	(a)	25.	(a)	26.	(a)	27.	(b)	28.	(c)
29.	(a)	30.	(c)	31.	(b)	32.	(c)	33.	(a)	34.	(b)	35.	(d)
36.	(b)	37.	(d)	38.	(b)	39.	(b)	40.	(a)	41.	(a)	42	(d)
43.	(a)	44.	(b)	45.	(a)	46.	(b)	47.	(b)	48.	(b)	49.	(c)
50.	(d)	51.	(d)	52.	(b)	53.	(c)						

5

PHOTOCHEMICAL REACTIONS

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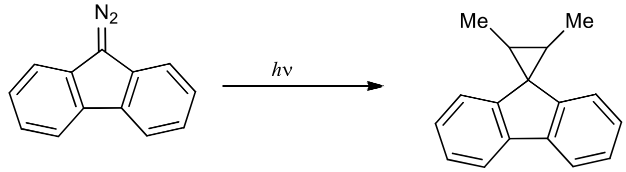
1. The intermediate involved in the reaction given below is :



(a) Free radical

(b) Carbocation

(c) Carbanion

(d) Carbene

2. The concerted photochemical reaction between two olefins leading to a cyclobutance ring is :

(a) $\pi 2s + \pi 2a$ cycloadition

(b) $\pi 2s + \pi 2s$ cycloaddition

(c) $\sigma 2s + \sigma 2s$ cycloaddition

(d) $\pi 2s + \sigma 2a$ cycloaddition

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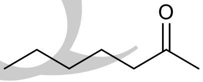
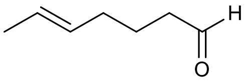
3. Match the following starting compunds with corresponding products in photochemical reactions :

Starting material | Proudcts

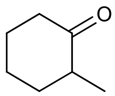
(i)



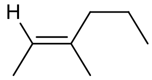
(A)

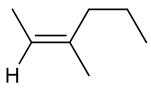


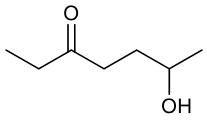
(ii)

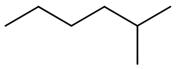


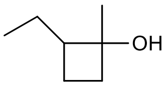
(B)



(iii) 

(C) 

(D) 

(E) 

(a) (i) – (E) (ii)–(A) (iii)–(B)

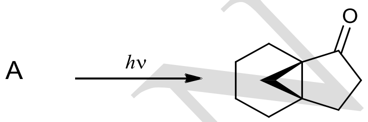
(b) (i)–(A) (ii)–(C) (iii)–(b)

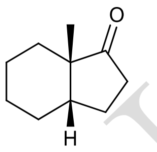
(c) (i)–(D) (ii)–(C) (iii)–(A)

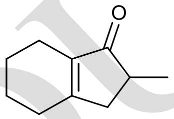
(d) (i)–(E) (ii)–(A) (iii)–(D)

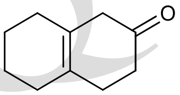
CSIR JUNE 2012

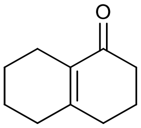
Q 4. Structure of the starting material A in the following photochemical Norrish reaction, is



(a) 

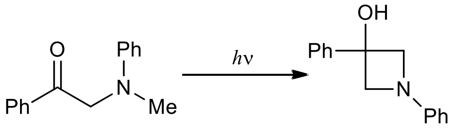
(b) 

(c) 

(d) 

CSIR DEC 2012

Q 5. The following photochemical transformation proceeds through



(a) Norrish type I reaction

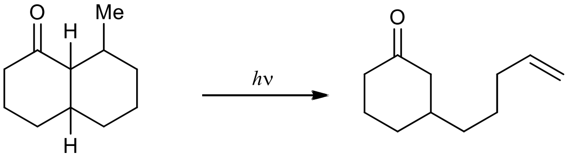
(b) Norrish type II reaction

(c) Barton reaction

(d) Paterno-Buchi reaction

CSIR JUNE 2013

Q 6. The following photochemical conversion proceeds through



(a) Barton reaction

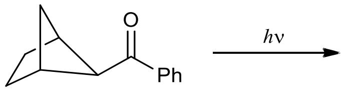
(b) Paterno-Büchi reaction

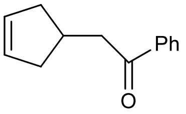
(c) Norrish type I reaction

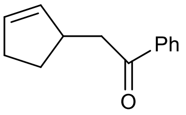
(d) Norrish type II reaction

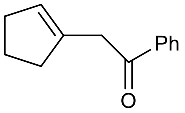
CSIR DEC 2013

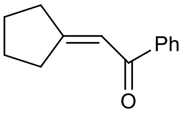
Q 7. The major product formed in the following photochemical reaction is



(a)


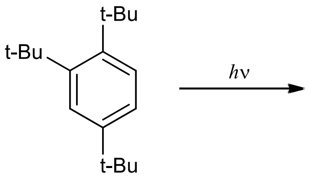
(b)


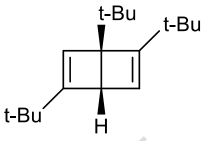
(c)


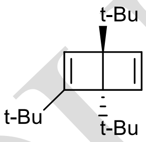
(d)


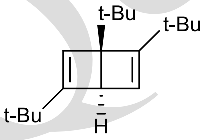
CSIR JUNE 2014

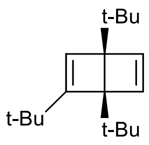
Q 8. The major product formed in the following photochemical reaction is



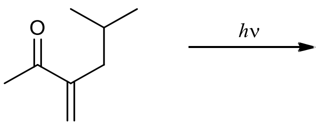
(a)


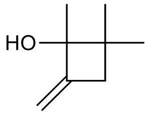
(b)


(c)


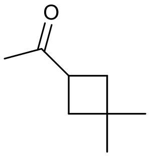
(d) 

Q 9. Amongst the following, the major products formed in the following photochemical reactions are

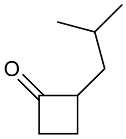




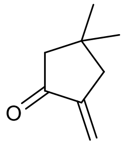
A



B



C



D

(a) A and C

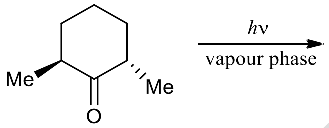
(b) B and C

(c) A and D

(d) A and B

CSIR DEC 2014

Q 10. The cyclic product(s) of the following photochemical reaction is(are)



(a) only *cis*-1, 2-dimethylcyclopentane

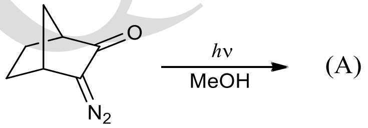
(b) only *trans*-1, 2-dimethylcyclopentane

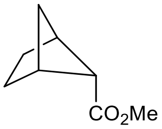
(c) a mixture of *cis*- and *trans*-1, 2-dimethylcyclopentanes

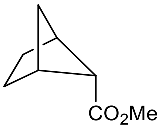
(d) only 2, 6-dimethylcyclohexanol

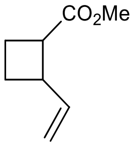
CSIR DEC 2015

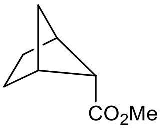
Q 11. The correct statement about the following reaction is that



(a) A =  **and the reaction proceeds through carbene intermediate**

(b) A =  **and the reaction proceeds through nitrene intermediate.**

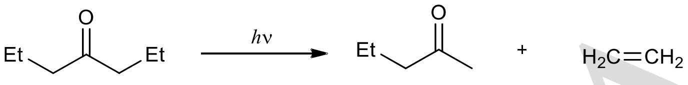
(c) A =  **and the reaction proceeds through Norrish type II path.**

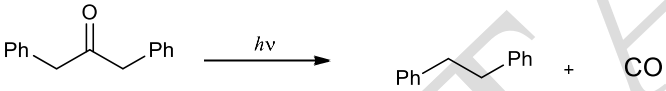
(d) A =  **and the reaction proceeds through Norrish type I path.**

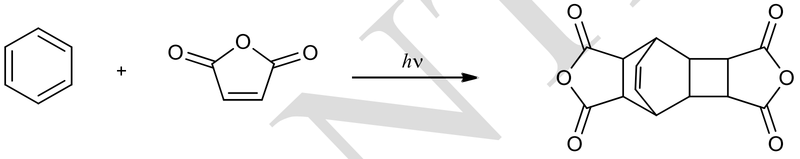
CSIR JUNE 2016

Q 12. The correct match for the following transformations P-S with the processes I-IV is

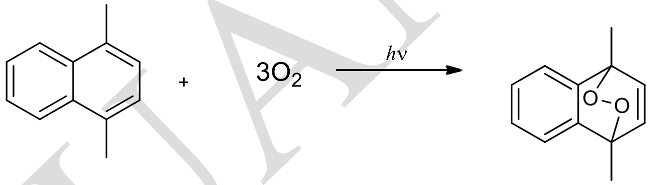
Reactions:

(P) 

(Q) 



(R)



(S)

Processes:

(I) Diels-Alder

(II) Norrish Type-I

(III) Photocycloaddition followed by Diels-Alder

(IV) Norrish Type-II

(a) P-II; Q-IV; R-III; S-I

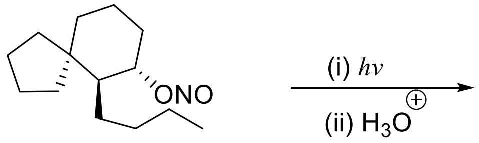
(b) P-II; Q-IV; R-I; S-II

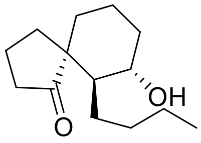
(c) P-IV; Q-II; R-III; S-I

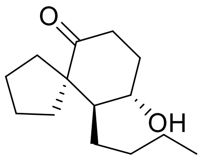
(d) P-IV; Q-II; R-I; S-III

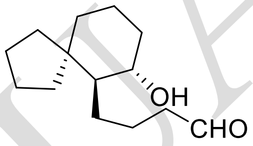
CSIR DEC 2016

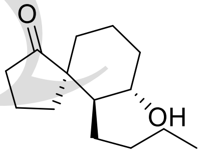
Q 13. The major product formed in the following reaction is



(a)


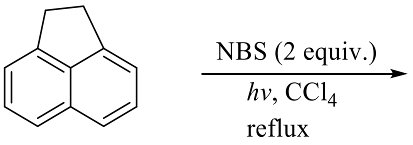
(b)


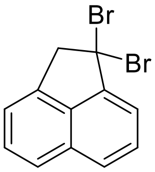
(c)


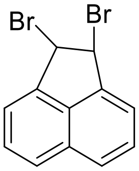
(d)


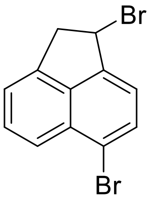
CSIR JUNE 2017

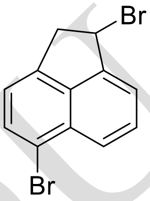
Q 14. The major product formed in the following reaction is:



(a)


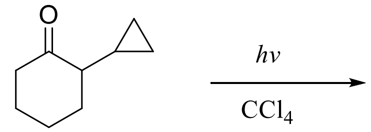
(b)


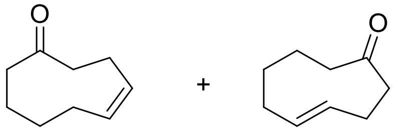
(c)


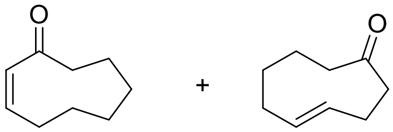
(d)


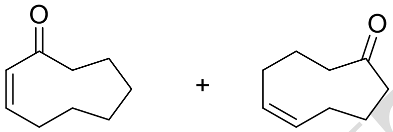
CSIR JUNE 2018

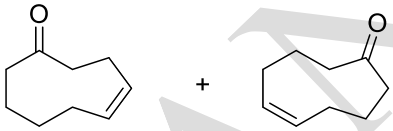
Q 15. The major products formed in the following photochemical reaction are



(a)


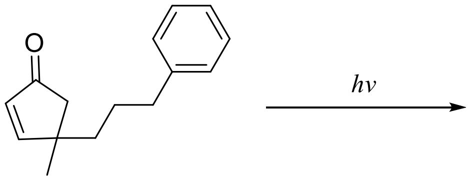
(b)


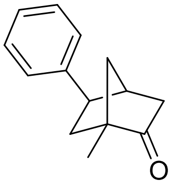
(c)


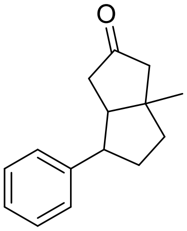
(d)


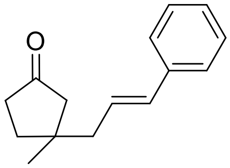
CSIR DEC 2018

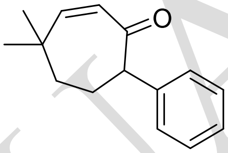
Q 16. The major product formed in the following photochemical reaction is



(a) 

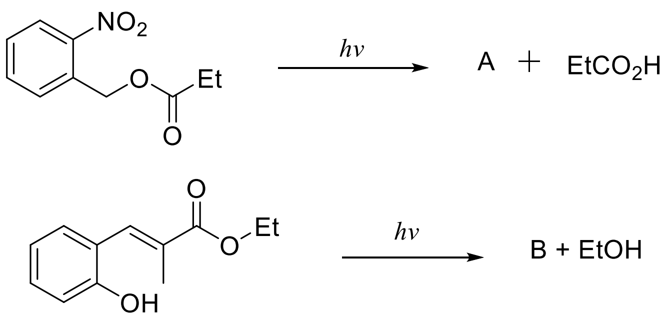
(b) 

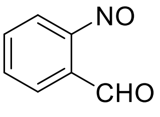
(c) 

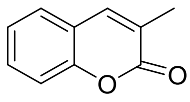
(d) 

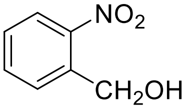
CSIR JUNE 2019

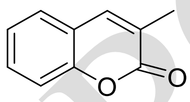
Q 17. Structures of the products A and B in the following photo-deprotection reactions are:

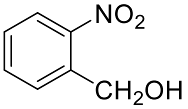


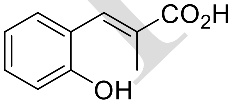
(a) **A =** 

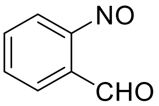
B = 

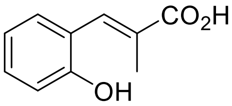
(b) **A =** 

B = 

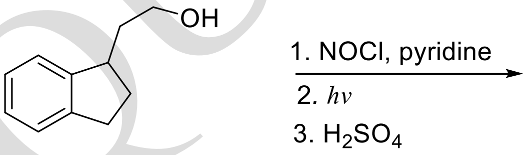
(c) **A =** 

B = 

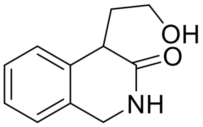
(d) **A =** 

B = 

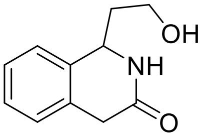
Q 18. The major product formed in the following reaction is:



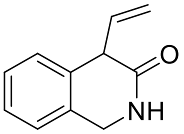
(a)



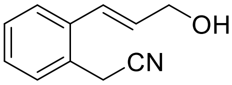
(b)



(c)



(d)



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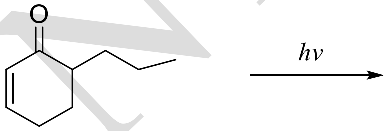
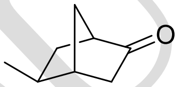
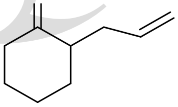
Q 19. The major product formed in the following reaction is

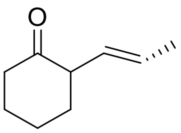


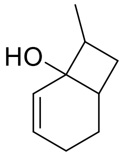
(a)



(b)



(c) 

(d) 

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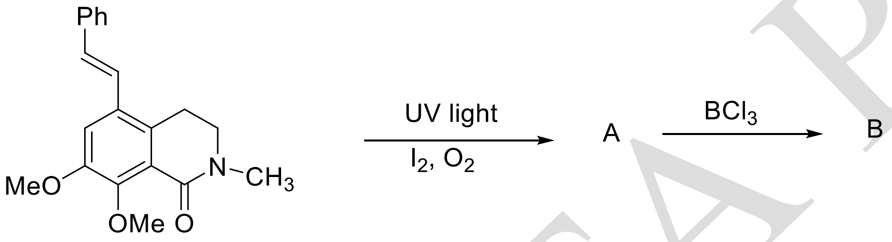
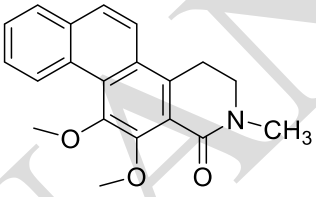
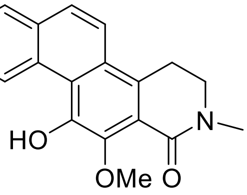
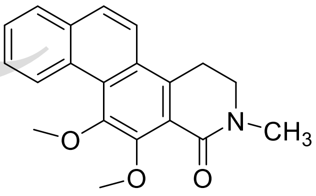
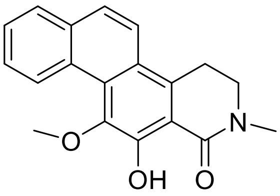
Q 20. The major products A and B formed in the following reactions are



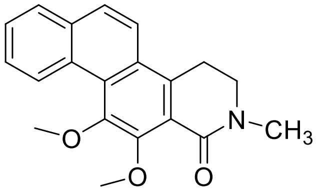
(a) A = 

B = 

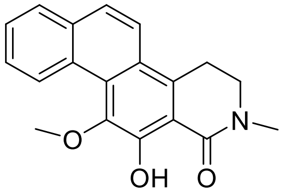
(b) A = 

B = 

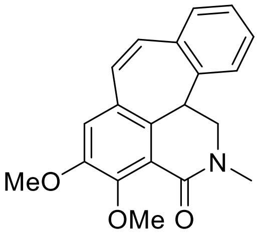
(c) A =



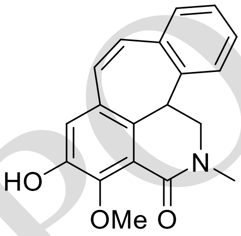
B =



(d) A =



B =



PHOTOCHEMISTRY

ANSWER KEY

1.	(d)	2.	(b)	3.	(a)	4.	(c)	5.	(b)	6.	(d)	7.	(b)
8.	(a)	9.	(d)	10.	(c)	11.	(a)	12.	(d)	13.	(a)	14.	(b)
15.	(a)	16.	(c)	17.	(a)	18.	(b)	19.	(d)	20.	(c)		